How to Use this Pest Management Guide for Home Grounds and Animals

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This 2026 Virginia Pest Management Guide provides the latest recommendations for controlling diseases, insects, and weeds for home grounds and animals. Also available in this guide is information about prevention, nonchemical control, and chemical control as part of an integrated pest management approach. The chemical controls in this guide are based on the latest pesticide label information at the time of writing. Since pesticide labels continuously change, read the label directions carefully before buying and using any pesticide. Regardless of the information provided here, always follow the latest product label instructions when using any pesticide.

Help Is as Close as the Local Extension Office

https://ext.vt.edu/offices.html – or in the blue (government) pages of your telephone directory.

Virginia Tech and Virginia State University are Virginia's land-grant universities. The land-grant universities were created to benefit each state through research and educational resources. To provide this opportunity to everyone in the United States, the land-grant university system was extended to localities through outreach programs, established as the Cooperative Extension Service in 1914.

The unique Cooperative Extension partnership that exists between the USDA, the commonwealth, and your home town means that individuals, families, businesses, institutions, and the community can find answers to many pest management questions through a local Extension agent.

How this Guide Is Designed

This guide includes an overview of best management practices associated with home grounds and animals. We include information and advice about non-chemical controls of insects and diseases such as: using resistant plants or companion plants to reduce pest attacks; how to incorporate beneficial insects, animals, and other organisms into a pest management plan to fight off harmful organisms; and mechanical ways to control pests that include using weed blocking textiles and mulches in vegetable or ornamental plantings. Information on labeled chemical controls for specific pests is also included to provide additional solutions for pest control. See page 1-5 Integrated Pest Management for more information. Pay special attention to recommendations related to the type of application equipment and personal protective equipment for the applicator. There are also warnings associated with specific chemicals, especially as they relate to fish, other wildlife, pets and pollinators.

This guide includes nonchemical and chemical control recommendations for pests in outdoor recreation areas, wood products and households. The animal chapters of this guide cover external parasites of dogs and cats, outline Virginia regulations in dealing with nuisance and wild animals, and discuss management options for these nuisance animals.

Each chapter also provides recommendations on when to hire a professional pest control firm. The end of this chapter has some advice on selecting a pest control company. Many pest control jobs require equipment, permits, or chemicals that are not available to homeowners.

Getting to the Right Place in the Guide

First, identify the problem. Most of the concerns addressed by this guide involve plants. What type of plant has the problem? Each plant's problem should be approached differently—such as, never apply chemical recommendations for ornamentals to edible crops. See the vegetable or fruit sections of this guide for recommendations regarding pest problems on edible crops.

It is hard to determine the significance of a pest until the pest is clearly identified. It is also difficult to control the pest without a proper identification. It is easy to recognize a fly or dandelion. With a self-help book or other reference it is also simple to identify many other insects and weeds. However, other pests can be difficult to identify. This is especially true for the organisms and conditions that cause plant diseases. Some plant diseases aren't even caused by living organisms. For example, some plant injuries or damages are caused by nonliving, or abiotic conditions, such as air pollution, chemicals, heat, drought, excess water, cold, or poor site selection.

Extension agents can help identify the cause of home garden problems and prescribe a control. If the problem is especially hard to identify, the Extension agent has the resources of Virginia Tech and Virginia State University to provide assistance. A specimen can be sent to Blacksburg for identification. After identifying a pest problem, the next step is to control it.

How Important Is Your Pest Problem?

A pest is any living organism that is undesirable or harms people, property, or the environment. Examples of issues associated with pests include: the discomfort caused by a pet's fleas; the destruction of food supply by pantry pests; the overgrowth of weeds in the lawn and garden; the loss of a favorite shade tree to blight; the health hazards associated with ticks; or the structural damage to a home caused by wood-infesting insects.

Is the pest problem worth controlling? Pest issues vary in their importance. Damage to a home is critical because it can be quite expensive and even dangerous. This kind of pest problem demands a quick, effective control. Other pest-related issues are not as important because they might not be as costly or dangerous. Low-priority problems don't always demand a quick and effective control. Some can even be ignored or eliminated by replacing the host plant. First evaluate how important the pest problem is, and if it is worth the effort and expense to control.

How Do You Choose a Pest Control Option?

When considering a pest control option, follow these important rules.

- Control a pest only when it is causing, or is expected to cause, more damage than is reasonable to accept.
- Use a control strategy that reduces the pest numbers to an acceptable level.
- Cause as little harm as possible to everything except the pest.

Avoiding Harmful Effects

Pest control involves more than simply identifying a pest and using a control measure. The treatment site, whether it is outdoors or inside a structure, usually contains other living organisms, such as people, animals, and plants, as well as the non-living surroundings, such as air, water, structures, objects and surfaces. All of these could be affected by pest control measures. It is important to consider the possible effects on the entire environment where the pest exists. Otherwise, pest control efforts could cause harm or create new pest problems. Use good judgment, and when pesticides are part of the strategy, read the pesticide labeling thoroughly.

Pest control strategies can be disruptive. The actions of one organism or component sharing the site can affect the actions and well being of many others. When the balance is disrupted, certain organisms may be destroyed or reduced in number, and others—sometimes the pests—may dominate.

Who Should Apply the Control?

Decide who is going to control the pest problem. Is the job simple enough to tackle at home, or is it better for a professional to handle? The next section is about hiring contractors for pest control management. Even avid do-it-yourselfers should consider hiring a professional if the job involves controlling wood infesting pests in a home or spraying trees. Many pest control options require special equipment and knowledge. Some pest control projects are too complicated and can be unsuccessful for the home gardener, resulting in a project that is far more expensive than originally estimated. In these situations, hiring a professional is best.

How to Choose a Pest Control Company

Termites chomp away at your house. Roaches infest the kitchen. Mouse droppings dot a dresser drawer. Spongy moths (formerly known as gypsy moths) eat trees in the front yard. The lawn needs a major overhaul. There is a hornets' nest in the walls. These are serious pest management problems that demand a professional applicator. But how can one be sure that the pest control company will do a good job?

Here are some questions to ask:

Does the company have a good track record?

Research this answer carefully. Ask neighbors and friends if they were satisfied with the service they received from a given company. Call the Better Business Bureau, the Virginia Department of Agriculture and Consumer Services (VDACS) - Office of Consumer Affairs or the VDACS Office of Pesticide Services (listed in the reference tables later in the chapter) to check if they have received any complaints about the company.

Does the company have insurance? What kind of insurance? Can the salesperson show some documentation to prove the company is insured?

Contractor's general liability insurance, including insurance for sudden and accidental pollution, gives the homeowner some protection should an accident occur while pesticides are applied. Contractor workers' compensation insurance can also help protect the homeowner, should an employee of the contractor be injured while working in your home.

In Virginia, pest control companies are required to carry liability insurance. Never contract with a company that is not insured.

Is the company licensed?

In Virginia, all pest control companies are required to carry a pesticide business license. All employees are required to be trained and certified as either registered technicians or commercial applicators. In addition, these applicators are required to be recertified every two years. The law requires that a certified commercial applicator be available to supervise the application of pesticides in a home. This direct supervision requirement means that the supervisor must be in direct contact with the applicator, but the supervisor does not have to be on site.

Ask the company manager and the applicator to show you both their pesticide business license and their current pesticide applicator's certificate before signing the contract.

Is the company affiliated with a professional association?

As a member of a professional association, these companies can keep up-to-date on the latest information on pest control methods, safety, training, research and regulation. Most associations also have a code of ethics that members agree to abide by. The fact that a company chooses to affiliate itself with a professional association is evidence that they are concerned about quality and professionalism in their work.

For pest control operators (PCOs) or exterminators, professional associations include the National Pest Management Association, the Virginia Pest Management Association, and several regional groups. Lawn care companies also belong to many local and regional associations. The national and state associations affiliated with these groups are the Professional Lawn Care Network (PLANET) and the Virginia Turfgrass Council (VTC). The Virginia Nursery and Landscape Association is also affiliated with many landscape firms who apply pesticides for hire in Virginia. The addresses of these groups are listed in the reference tables later in the chapter.

Does the company stand behind its work? What assurances does the company make?

Think twice about dealing with a company unwilling to stand behind its work. The homeowner also has a role in this. For example, in the case of termite control treatments, a guarantee could be invalidated if the homeowner makes structural changes to the treated building without notifying the pest control company. In addition, many companies require an annual inspection or maintenance contract to keep the guarantee valid. Read the contract's fine print and ask questions.

Is the company willing and able to discuss the treatment plan?

Selecting a pest control service is just as important as selecting other professional services. Look for the same high degree of competence you would expect from any professional. The company should inspect the premises and outline a recommended control program, including: what pests are to be controlled; the extent of the infestation; what pesticide formulations will be used in your home and why; what methods will be used in the application; and any available alternative control methods. The control program should also outline any special instructions the homeowner should follow to reduce exposure to the treatment, such as vacating the house, emptying cupboards, removing pets, when it is safe to reenter the home, and what the homeowner can do to minimize pest problems in the future.

Contracts should be developed jointly with the customer. Any safety concerns should be noted and reflected in the choice of pesticides to be used. These concerns should include the health of the residing occupants (including allergies), the age of the occupants (such as infants and the elderly), or whether or not pets reside on the premises. Get bids from two or three different companies, and judge by value, not price. What appears to be a bargain may merit a second look. Don't always settle on the lowest bid. Look for quality.

After hiring a company, continue to monitor the work closely and evaluate results. If there is any reason to believe that something has gone wrong with the pesticide application, contact the company and discuss it with them. If the solution is unsatisfactory and continued negotiation does not work, contact the VDACS Office of Pesticide Services for help. They are listed in the reference tables later in the chapter. Document everything, ask detailed questions, and remain vigilant. Misunderstandings and poor communication about the outcome of a job can end up in court or cause great distress. Understand all the details before signing the contract, especially those concerning the risks of using pesticides.

Human risk is related to the toxicity of the pesticide and the potential for exposure. Just because a pesticide is being applied does not necessarily mean there is a significant risk of harm, provided exposure is kept to a minimum. Know what is being done to minimize potential risks before committing to the treatment. Ask your contractor to share the product labeling information and Safety Data Sheets (SDSs) on the chemicals being used. If the contractor refuses, look elsewhere for service.

What about Integrated Pest Management (IPM)?

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Integrated Pest Management (IPM) combines several pest control tactics into a single plan to reduce pests and their damage to an acceptable level. Using many different tactics to control a pest problem causes the least disruption to the living organisms and non-living surroundings at the treatment site. Relying only on pesticides for pest control can cause pests to develop resistance to pesticides, can cause outbreaks of other pests, and can harm surfaces and non-target organisms. With some types of pests, only using pesticides achieves very poor control.

To solve pest problems, you should:

- Identify the pest or pests and determine whether control is warranted for each;
- Determine pest control goals;
- Know what control tactics are available;
- Evaluate the benefits and risks of each tactic or combination of tactics;
- Choose the most effective strategy that causes the least harm to people and the environment;
- Use each tactic in the strategy correctly; and
- Observe local, state, and federal regulations that apply to the situation.

The best strategy for each situation depends on the type of pest and the control needed.

Can You Take Advantage of Natural Controls?

Some natural forces act on all organisms, causing the populations to rise and fall. These natural forces act independently of humans and may help or hinder pest control. It might not be possible to alter the action of natural forces on a pest population. Be aware of the influence of natural forces and take advantage of them when possible. Natural forces that affect pest populations include climate, natural enemies, natural barriers, availability of shelter, and food and water supplies.

Climate

Weather conditions, especially temperature, day length, and humidity, affect pest activity and rate of reproduction. Rain, freezing temperatures, drought, or other adverse weather conditions may kill or suppress pests. Climate also affects pests indirectly by influencing growth and development of their hosts. For example, the population buildup of plant-eating pests can be related to the growth of its host plants. Unusual weather conditions can change normal patterns, which can lead to an increase or decrease in potential pest damage.

Natural Enemies

Birds, reptiles, amphibians, fish, and mammals feed on some pests and help keep populations down. Many predatory and parasitic insects and insect-like species feed on other organisms, some of which are pests. Pathogens often suppress pest populations. Creating a backyard environment that attracts beneficial insects and other natural enemies can help control pests on desirable plants.

Geographic Barriers

Mountains and large bodies of water restrict the spread of many pests. Other landscape features can have similar effects.

Food and Water Supply

Pest populations thrive only if their food and water supply lasts. Once the food source is gone, the pests die or become inactive. The life cycle of all living organisms depends on access to water.

Shelter

The availability of shelter can affect some pest populations. Overwintering sites and hiding spots are important for some pests. Rocks and logs in a garden are a good example of where pests, like slugs and snails, may find a safe haven from the sun and predators.

What Are Applied Controls?

Unfortunately, natural controls do not always control pests quickly or completely enough to prevent injury or damage. At these times, other control measures are necessary. Those available include:

- host resistance,
- biological control,
- cultural control,
- mechanical control,
- sanitation, and
- chemical control.

Host resistance: Some plants, animals, and structures resist pest attacks better than others. Some varieties of plants, wood, and animals are resistant to certain pests. Using resistant species and varieties, when available, helps control pest populations.

Host resistance works in three ways.

- Chemicals in the host repel the pest or prevent the pest from completing its life cycle.
- The host is more vigorous or tolerant than other varieties, and less likely to be damaged by pest attacks.
- The host has physical characteristics that make it more difficult to attack.

Biological control: A pest's natural enemies, like parasites, predators, and pathogens, can be used against it. Biological control may be supplemented by legally releasing, or enhancing the environment favoring the growth of, a pest's natural enemies in the target area. This might include creating habitats that favor predators or competitors not harmful to desirable host plants and animals. Biological control usually does not eradicate a pest, and the degree of control can change. There is a time lag between a pest population's increase and a corresponding increase in natural control. Under proper conditions, sufficient control can protect threatened plants or animals. Biological control also includes biologically altering the pest. This can include producing and releasing large numbers of sterile males; the use of sex attractants, called pheromones; or juvenile hormones. Pheromones can be used to monitor pest populations. Pheromones placed in a trap can attract insects in a sample area so that pest numbers are more easily estimated. Pheromones can also be a control tool. A manufactured copy of the pheromone that a female insect uses to attract males can be used to confuse males and prevent mating, leading to lower numbers of pests. Applying juvenile hormones to an area can reduce pest numbers by keeping immature pests from becoming reproducing adults.

Cultural control: Changing the environment, the condition of the host plant or animal, or the behavior of the pest can prevent or suppress an infestation. Cultural controls disrupt the normal relationship between the pest and the host plant or animal and make the pest less likely to survive, grow or reproduce. Common cultural practices include rotating crops, cultivating the soil, varying the time of planting and harvesting, planting trap crops, adjusting row width, and pruning, thinning and fertilizing cultivated plants.

Mechanical control: Adding physical controls to the environment, the host plant or animal, and/or the pest can help prevent or suppress an infestation. Mechanical controls include traps, screens, barriers, fences, nets, radiation, and electricity. Lights, heat, and refrigeration can alter the environment enough to suppress or eradicate some pest populations. Altering the amount of water, including humidity, can control some pests, especially insects and disease agents.

Sanitation: Keeping an area clean can help prevent and suppress some pests by removing the pests or removing their sources of food and shelter. Improve cleanliness, eliminate pest harborage, and increase the frequency of garbage pickup to reduce urban and industrial pests. Good manure management practices can prevent pests that attack domestic animals. Removing crop residues, and decontaminating equipment and other possible carriers before allowing them to enter a pest-free area or leave an infested area can reduce the carryover of agricultural pests from one planting to the next. The proper design of food-handling areas reduces access and shelter for many pests.

Chemical control: It is common practice to use pesticides to kill, repel, or prevent pests from causing damage. Chemicals that regulate plant growth or remove foliage are also classified as pesticides. Disinfectants and other common household chemicals may be classified as pesticides as well. Depending on the pest, pesticides can be the fastest way to control pests. In some instances, they are the only tactics available.

For additional information on IPM, please see:

An Introduction to Integrated Pest Management https://www.pubs.ext.vt.edu/ENTO/ENTO-365/ENTO-365.html.

Safe and Effective Use of Pesticides for Home Grounds and Animals

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Many of the control recommendations in this guide are chemical because they have been shown through research to work in a safe, effective, and efficient manner. Pest control recommendations are ever changing, which is evident in some sections of this guide where alternative controls have been added as research shows they can work under Virginia conditions. The authors will continue to add alternative controls to this guide as this information becomes available from research results produced by Virginia Tech, Virginia State, and other nearby test sites.

Although pesticides are a controversial subject and are often viewed in a negative light by the general public, they do have their place in pest management. Those of us who condemn all uses of pesticides, and those who quickly decide to apply these chemicals without consideration of alternatives are guilty of not weighing the issue properly. There are situations where pesticides are necessary. There are just as many cases where they don't need to be used as a "magic cure-all." This is especially true around the home. In many cases, home pest problems can be solved without the use of pesticides.

The rest of this section is directed toward the safe and proper use of pesticides for those who have weighed the information so far and decided to use a chemical control. There are sections on the label concerning environmental hazards and prevention of exposure, as well as how to safely handle pesticides and deal with emergency situations. In addition, there are a number of tables and sources listed to help you employ these chemicals safely and efficiently. If there is any piece of advice that you should remember from using this guide, it is to **read the pesticide label**. The label is the key to the proper and safe use of all pesticide products.

The Pesticide Label

If you decide to use a pesticide, you will most likely purchase these chemicals from a local outlet. Before you go to this outlet, please make sure you are prepared. You should already know what pest you are trying to control, how you are going to apply a pesticide *(the types of equipment and methods available to you for application)*, and have established how important it is to control the pest.

With these factors in mind, you can go to your supplier and either ask for help or scan the shelves for the proper control. If you ask for help, make sure you read the product label carefully before you buy the pesticide and not just go on the word of a clerk. There have been many situations where a person asked for advice at the store and came home with the wrong chemical. This is especially critical when you are shopping for a pesticide to apply on plants grown for food. Read the product label before you buy the pesticide to make sure you can use the chemical to control your pest problem. Is the product labeled for your crop or animal? If not, you cannot use it legally or safely. Read carefully for when to apply, how much to apply, and what type of equipment is needed to apply the pesticide.

For further information on pesticide labels, refer to: https://www.pubs.ext.vt.edu/ENTO/ENTO-390/ENTO-390.html.

What Formulation Is Best for Your Situation?

Pesticide products are sold as concentrated formulations, which require mixing before use, and as ready-to-use formulations. Concentrates are generally less expensive per treatment than ready-to-use formulations, but present other problems. Examples of concentrates include wettable powders (W or WP), emulsifiable concentrates (E or EC), soluble powders (SP), and flowables (F). Do you have the means to mix, pour, and apply a concentrate safely? If you buy too much, which is usually the case with most homeowners using concentrates, keep in mind that you might have to store any remaining concentrate at your home. If you store many pesticides longer than a few years, they will deteriorate and lose their effectiveness (yet still be toxic). Are you prepared to possibly pay to have your chemical disposed of through a hazardous waste service, or wait until a Pesticide Collection Program comes to your area? If you throw the waste chemical into the garbage you could create a hazard to others and the environment.

Other formulations are sold ready-to-use. These can be applied directly without mixing and include: solutions (S), aerosols (A), dusts (D), pellets (P), granules (G), and baits (B). You should purchase only enough pesticide to use in one season. Look for products with reduced packaging that are low in toxicity, present few hazards to the environment, and allow you to use them without having to handle, store, or dispose of concentrates. In addition, pick products that won't require you to purchase expensive application equipment in order to apply them. Some products are now sold in single dose packaging, which eliminates the problem of storing excess pesticide concentrates.

What Are the Parts of the Product Label?

The most important piece of information available to you is the pesticide product label. It is a legal document and is required to list all pertinent information about the product. You should become familiar with the different parts of the pesticide label. The information below corresponds to the numbers on the sample label to follow.

1) **Product Name:** includes the name of the manufacturer (ChemCo), the product name (NoPest), and the function of the product (Insect Killer).

2) **Ingredient Statement:** includes the amount of active ingredient by percent (8.0%) of the total product and identifies the ingredients by common name (deltathion) and chemical name (1,2 phospho-(5)-4-chloromethane).

3) **Toxicity Signal Word:** identifies the toxicity signal word (WARNING) which indicates that this product is moderately toxic to humans exposed to the chemical.

4) **EPA Registration Number** (999-000) is a code number that identifies the product by number according to EPA's product registration database. The first number (999) is specific to the company and the second (000) identifies the product. This number is very helpful when identifying the product if other parts of the label become unreadable.

5) **Precautionary Statements:**

   Hazards to Humans and Domestic Animals: warns the users how to protect themselves, what the hazards are to the eyes, the skin, the respiratory system, or if swallowed. The label also prescribes first aid measures and information for a physician (Note to Physician). This information should be provided to your doctor if you are exposed or poisoned.

   Environmental Hazards: warns the user about potential hazards to wildlife, to water from runoff and leaching, and to air from drift.

   Physical or Chemical Hazards: warns the user that the product is flammable and may cause a fire if not handled properly.

6.) **Directions for Use:** indicate it is a violation of Federal (and State) law to use the product in a manner inconsistent with its label directions. Violation can mean fines and criminal penalties. It can also mean possible civil law suits from injured parties. Use directions also tell you how much to use, on what pest, and on what crops. These statements are critical since the product cannot be used on any other crops, especially food crops. Also, the rates are very specific to the product. They should be followed closely. The label also warns you not to apply the product to unusual varieties including several named in a special note. Application on these varieties could injure or kill these plants.

7) **Storage and Disposal:** indicates how to properly store the product and how to handle the product for disposal.

8) Provides the **name and address of the manufacturer** and the **EPA Establishment Number** (EPA Est. No. 999-VA-1) which is important if the product is defective. It indicates which facility produced the product. Some products also include a lot number on the label.

SPECIAL NOTE: The EPA has added a "bee advisory box" to pesticide labels. An example of this box follows the sample label. Applicators should use extra caution to avoid exposing beneficial insects, such as the honey bee, to pesticides. Applying pesticides to blooming plants or allowing pesticides to drift to areas where pollinators feed or live is illegal and should be avoided. Our pollinators are in crisis, and impacting their habitats and food sources with pesticides is part of the cause. Use common sense when using pesticides around all non-target organisms.

ChemCo NoPest Insect Killer

1

Makes up to 8 Gallons Spray

Controls: Aphids, Mites, Thrips, Mealybugs, Whiteflies, Scale, and many other listed pests on Roses, Flowers, Ornamentals, Shrubs, and Trees.

Active Ingredients: Deltathion (1,2 phospho-(5)-4-chloromethane) **8.0%**

Inert Ingredients: 2 ..... **92.0%**

KEEP OUT OF REACH OF CHILDREN

WARNING

3

Net Contents 8 FL. OZ. 4 **EPA Reg. No. 999-000**

Precautionary Statements

5

HAZARDS TO HUMANS & DOMESTIC ANIMALS

WARNING: Applicator should wear long-sleeved shirt, long pants, goggles, chemical-resistant gloves, socks, and shoes. Causes eye irritation. Do not get in eyes. Avoid contact with skin or clothing. Harmfull if swallowed. Avoid breathing vapor or spray mist. Wash thoroughly after handling. In case of eye contact, immediately flush eyes with fresh water for 15 minutes and get medical attention. If swallowed, promptly drink a large quantity of water and induce vomiting. Get medical attention immediately.

Note to Physician: Emergency Information–call (800) 555-5555 This product contains a cholinesterase inhibitor. If signs and symptoms of cholinesterase inhibition are present, atropine is antidotal. 2-PAM may also be given in conjunction with atropine.

ENVIRONMENTAL HAZARDS: This pesticide is toxic to fish. Use with care when applying in areas adjacent to any body of water. Keep out of lakes, ponds, and streams. Do not apply when weather conditions favor runoff or drift from treated areas. Do not contaminate water by cleaning equipment or disposal of wastes.

PHYSICAL OR CHEMICAL HAZARDS: Flammable. Keep away from heat or open flame.

6 **DIRECTIONS FOR USE:** It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH LABEL PRECAUTIONS AND DIRECTIONS.

HOW TO USE: Mix thoroughly and spray entire plant, covering both upper and lower leaf surfaces. This product is designed for outdoor use only by home gardeners. It has not been tested on rare unusual varieties; therefore, when these plants are present, it is advisable to test on a few plants before spraying large numbers. **Do not apply to plants to be used for food or feed. Rate to apply – Aphids and Grasshoppers on Roses, Flowers, Shrubs, and Trees as Listed:** Apply 2 TBSP. (1 fl. oz.) to 1 gal. water. Spray as aphids appear. Repeat if infestation occurs.

All other Listed Pests on Roses, Flowers Shrubs, and Trees as Listed: Apply 3 TBSP (1.5 fl. oz.) to 1 gal water. Spray when insects or mites are present or feeding damage is first noticed. Repeat if reinfestation occurs. For Mealybugs, Flower Thrips, Whiteflies, Mites, Scales, and other hard to control pests, spray 2-3 times about 7-10 days apart. Clean sprayer after each use by flushing with water. Do not use household bleach as a cleaning agent.

CONTROLS: Aphids, Bagworms, Beet Armyworm, Birch Leafminer, Budworms, Grasshoppers, Gypsy Moth (larvae), Holly Leafminer, Lacebugs, Leafrollers, Leafhoppers, Mealybugs, Sawflies, Scales (crawlers), Stinkbugs, Thrips, Tent Caterpillars, Two-spotted Spear Mites, Whiteflies.

PLANTS: Ageratum, Alyssum, Arborvitae, Aster, Azalea, Birch, Boston Ivy, Bottlebrush, Clendula, Camellia, Cottonwood, Crapemyrtle, Marigold, Oak, Petunia, Pyracantha, Rose, Snapdragon, Spruce, Stock, Yew, Zinnia.

NOTE: Do not apply to American Elm, Flowering Crabapple, Sugar Maple, Red Maple, Redbud, Begonia, and Weigela as foliage injury may occur.

STORAGE AND DISPOSAL: Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not contaminate food or foodstuffs. Do not store diluted spray. Do not reuse empty container. Wrap container and put in trash collection. 7

NOTICE: Buyer assumes all responsibility for safety and use not in accordance with directions.

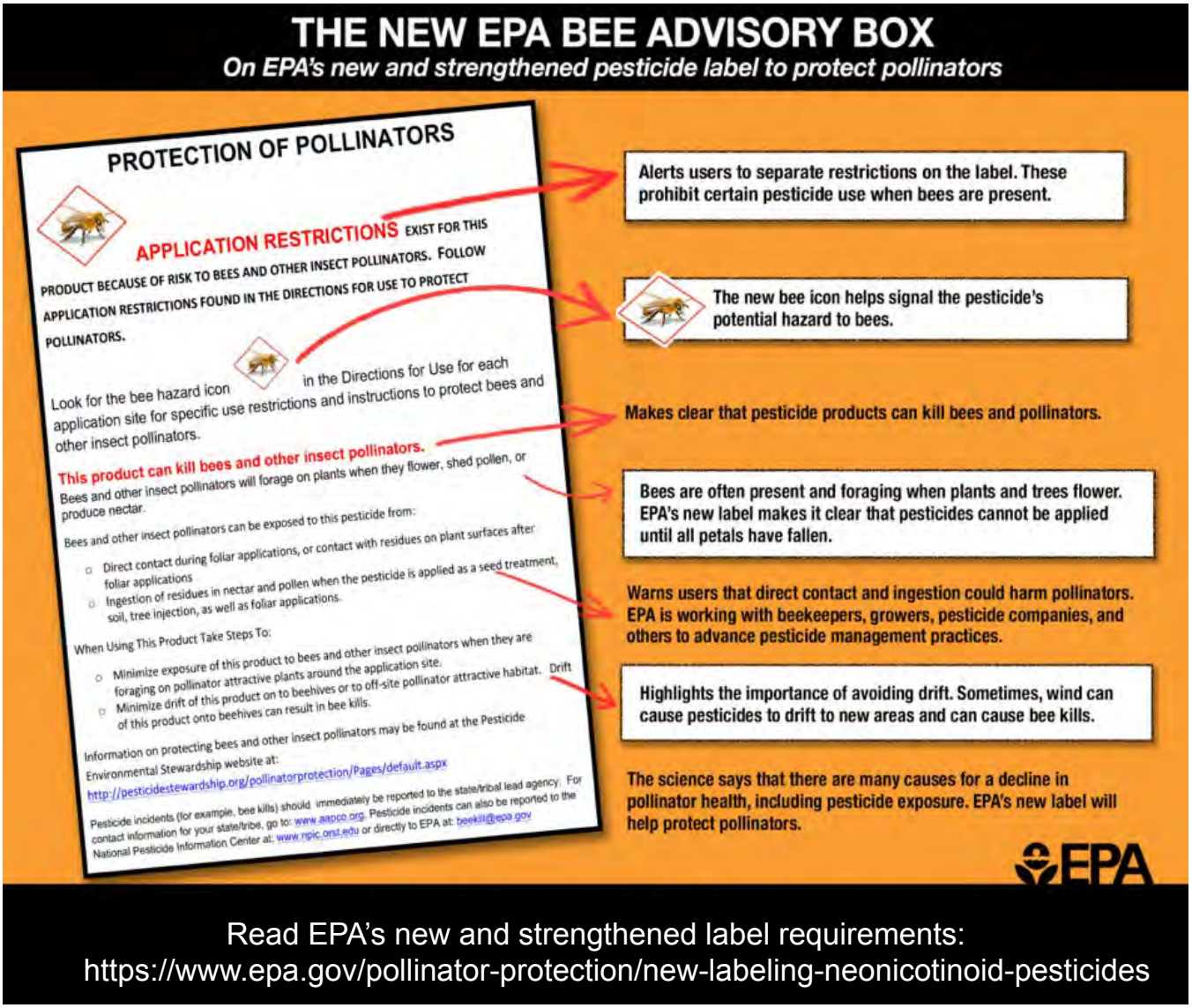
ChemCo, Inc.
123 South Main Street
New Kenzee, VA 24000-0011
Product 1234 Made in the USA
Form 12300-E
EPA Reg. No. 999-000
EPA Est. No. 999-VA-1 8

2018©

SAMPLE ONLY

SAMPLE ONLY

THE INFORMATION PRINTED IN THIS EXAMPLE SHOULD NOT BE USED IN PLACE OF THE INFORMATION PRINTED ON THE ACTUAL PESTICIDE LABEL.


THE NEW EPA BEE ADVISORY BOX
On EPA's new and strengthened pesticide label to protect pollinators
PROTECTION OF POLLINATORS
APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.
Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.
This product can kill bees and other insect pollinators.
Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.
Bees and other insect pollinators can be exposed to this pesticide from:
Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.
When Using This Product Take Steps To:
Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives can result in bee kills.
Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at:
http://pesticidestewardship.org/pollinatorprotection/Pages/default.aspx
Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state/tribe, go to: www.aapco.org. Pesticide incidents can also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov
Alerts users to separate restrictions on the label. These prohibit certain pesticide use when bees are present.
The new bee icon helps signal the pesticide's potential hazard to bees.
Makes clear that pesticide products can kill bees and pollinators.
Bees are often present and foraging when plants and trees flower. EPA's new label makes it clear that pesticides cannot be applied until all petals have fallen.
Warns users that direct contact and ingestion could harm pollinators. EPA is working with beekeepers, growers, pesticide companies, and others to advance pesticide management practices.
Highlights the importance of avoiding drift. Sometimes, wind can cause pesticides to drift to new areas and can cause bee kills.
The science says that there are many causes for a decline in pollinator health, including pesticide exposure. EPA's new label will help protect pollinators.
EPA
Read EPA's new and strengthened label requirements:
https://www.epa.gov/pollinator-protection/new-labeling-neonicotinoid-pesticides

Environmental Considerations

Water Quality

Protecting our water resources is very important. Both surface and groundwater can be vulnerable to contamination from pesticides and fertilizers.

Ground Water

Ground water supplies are held in and move through geological formations called aquifers. Your home most likely sits over a local aquifer which supplies drinking water to you and your neighbors through your well or public water authority. In Virginia, about 90% of rural residents depend on groundwater from these aquifers for drinking water.

Careless use of pesticides and fertilizers can contaminate ground water by leaching (seeping) into the soil and eventually coming into contact with the water table. If a pesticide is persistent (lasts more than one season in the environment), is highly water soluble, or is highly toxic, it can reach the ground water and contaminate it. This is especially possible if the soils in your area are sandy or gravely in nature. In some areas of Virginia, geologic strata make the aquifers more vulnerable. These strata include the sandy areas of the coastal plains of eastern Virginia, the limestone *(Karst)* soils of the Blue Ridge Mountains of western Virginia, and the shale soils in the Highlands of southwestern Virginia. Other conditions which make ground water more vulnerable are excessive rainfall, irrigation, sinkholes, old wells, and other conduits to the aquifer. Even more dangerous are hot spots (point sources) caused by pesticide spills, backsiphoning*, careless mixing, improper storage, and illegal disposal. Hot spots are the leading cause of groundwater contamination from pesticides. The pesticide label will indicate if the pesticide you select is especially hazardous in these situations. In addition, you should take special precautions to limit the use of pesticides and even more importantly the excessive use of fertilizers. Fertilizers have been found in much greater amounts in water supplies than pesticides.

**Backsiphoning happens when a pesticide is pulled back into a water source where a fill hose is allowed to come into contact with the mix water in a spray tank. Homeowners should make sure that their spigots have a backflow preventer attached to prevent this potential problem. These devices are available at your local hardware store for less than $25.00. More importantly, make sure that there is an air gap present at all times between your water source and the spray tank or container you are filling!*

Surface Water

Another hazard of pesticide and fertilizer use is the potential for runoff into surface waters. Surface waters are known to recharge the groundwater in some aquifers. Therefore, contaminated surface water can be a threat to both surface and underground water resources.

Some pesticide and fertilizer products have greater potential for runoff than other products. If you apply a pesticide or fertilizer before a rain, or if you water your lawn or garden heavily just after an application, there is a good chance you are going to wash off the pesticide or fertilizer you just applied. Again, choose your chemical wisely; the product label and the charts at the end of this section will indicate whether a particular chemical poses a risk to water resources. Limit your use of chemicals only to the necessary amounts to do the job. Be even more cautious if you live near a stream or lake. In many subdivisions and urban areas, storm drains empty directly into nearby bodies of water. Any runoff from your property is likely to follow these storm drains to a local river or lake.

Farmers along the Chesapeake Bay area employ grass filter strips and planted buffer zones to reduce runoff. The turf areas on your property act in a similar manner and can be very effective in preventing many harmful chemicals from running off your property. By properly maintaining these areas or by planting new areas on your property, you too can employ similar protection to the water resources in your area. Contact your local water conservation district or Extension office for help with applying these methods to your property.

Air Quality

Pesticides can drift if applied under windy conditions or directed into the air. Pesticide drift is illegal and can be quite harmful to the plants, animals, people, and surfaces it contacts. For example, if you spray your lawn with 2,4-D or other phenoxy herbicides and these materials drift into a neighbor's yard or your garden, they can be quite damaging to desirable plants. Plants such as grapes, tomato, tobacco, ornamentals, flowers, garden vegetables, and fruit trees can be badly damaged by drift from these pesticides. Other herbicides also have the potential to cause extensive damage to non-target plants. Drift of insecticides and other toxic chemicals can poison animals and people. Some of the carriers and the pesticides themselves can also damage the surfaces they contact. Contact with painted surfaces, such as those on automobiles, can result in expensive damage. Contact with children's toys, swimming pools, and pet dishes all present exposure hazards to people and pets.

Drift onto walkways can be tracked into homes and adjacent areas, or can come into contact with bare feet. There have been cases where herbicides were allowed to drift onto a sidewalk (from a spot application) and later tracked into nearby turf areas. Weeks later a path of dead grass appeared where the chemical was tracked into the adjacent lawn.

Soils

The soil isn't just the substrate holding your plants in the ground. The soil is a very active environment which can play an important role in the breakdown of many chemicals. Nutrients important to the growth of plants are broken down in the soil to usable elements. The soil environment also holds and breaks down many pesticides. However, too much of a particular chemical can contaminate the soil environment to an extent where it is no longer alive. In other cases, chemicals can move through the soil and damage nearby trees and other desirable plants. The soil/water environment allows chemicals to travel through the soil. Again, follow all label directions, add organic material to your soils to encourage biodegradation of pesticides and other chemicals, and reduce your pesticide use by employing alternative controls.

Non-Target Organisms

Pesticides can be quite harmful to non-target animals and plants. We mentioned the potential damage to many plants earlier. Animals, both wild and domestic, can be harmed by careless pesticide use. Your backyard is home to many wild birds and animals. Many pesticides, especially insecticides, can directly and indirectly kill these animals. Birds in particular are very susceptible to pesticide poisoning. Careless use of some granular insecticides has been known to kill large numbers of birds in one feeding. If you use granules, make sure you incorporate them into the soil by watering or burying them. Birds can also be poisoned when they come into contact with treated surfaces or by eating treated food sources. Avoid spraying ripened fruit or flowers; cover plants with netting to prevent birds from contacting or eating treated plants. Birds can also feed on poisoned insects or lose these sources of food when they are killed by insecticides. Applications of herbicides can change wildlife habitats to where they are no longer habitable. Be careful when applying all pesticides and consider the impact of these chemicals on wildlife.

Other non-target organisms such as fish, bees, and beneficial invertebrates (insects, earthworms, etc.) are also susceptible to poisoning from pesticides. By eliminating beneficial organisms, your pest control problem can actually get worse. Consider alternatives and always consult the Environmental Hazards statement of the pesticide label before use. For more information on the impact of certain pesticides on wildlife and other non-target organisms, refer to the reference tables at the end of this section of the guide.

Pets and other domestic animals are just as vulnerable to pesticides. Keep pets and other domestic animals out of treated areas for as long as the pesticide label recommends. Also be cautious when applying flea and tick controls to your pets. The label of these products includes dosage instructions and will tell you how to apply these treatments and how often they can be used. Keep a close eye on your pets after treatment and watch for any adverse reactions. Consult your veterinarian for advice on the appropriate flea and tick treatments for your pets.

If you have a question about pesticide poisoning of pets or other domestic animals, please contact your veterinarian. This is your most reliable source. The veterinarian may contact other sources for you. Be careful about using Internet sources or other unknown sources of information, especially regarding treatment. Another reliable source of toxicological information is the ASPCA Animal Poison Control Center at (888) 426-4435. A charge may apply. See https://www.aspca.org/pet-care/animal-poison-control for details.

For assistance with wildlife poisonings or protection, contact your local Virginia Game Commission official.

Preventing Human Exposure and Poisonings

We have discussed the many precautions necessary to protect the environment and non-target organisms. The most vulnerable organism associated with pesticide use is yourself—the applicator. The person applying pesticides has the potential to come into contact with concentrated formulations when handling these chemicals. Even if you use less concentrated forms, you still can contact these materials in a much larger amount than when they are released into the environment. It is for this reason that you must be especially careful to prevent contact. Remember, there is no hazard associated with pesticide use if you are not exposed to the chemical itself. Even with highly toxic pesticides, applicators can reduce their hazard to very low levels by preventing exposure.

The Dose Makes the Poison

The potential for a pesticide to cause injury depends on several factors:

Toxicity of the Active Ingredient

Toxicity is the measure of the inherent ability of a chemical to produce injury. Some pesticides, such as pyrethrins, have low human toxicity while others, such as parathion, are highly toxic.

A pesticide's toxicity is listed on the product label according to a three-tiered signal word rating system. Most consumer chemicals are rated as low to moderate toxicity. Labels using the signal word "CAUTION" are rated as low toxicity pesticides. Those using the "WARNING" signal word are moderately toxic, and those using the "DANGER" signal word are highly toxic or highly corrosive. Avoid using any pesticide marketed for agricultural or commercial use. These chemicals are marketed for farm use and usually are concentrates formulated to be mixed for application on large acreage. For these reasons, mixing these products can be hazardous. Some chemicals may use the "DANGER-POISON" signal word with a red skull with crossbones, which means they can be extremely hazardous. Consumers are not equipped to handle these pesticides. Acute toxicity is based on the following ratings:

Table 1.1 - Toxicity Categories

Product Signal Word	Toxicity Category	Oral LD50 (mg/kg)[1]	Probable Adult Lethal Dose
DANGER/DANGER-POISON	highly toxic	0-50	a few drops to 1 teaspoon
WARNING	moderately toxic	50-500	1 - 2 teaspoons
CAUTION	slightly toxic	500-5000	1 ounce - 1 pint (pound)
CAUTION	almost non-toxic	more than 5000	1 pint (pound)

[1]The amount in milligrams of chemical per kilogram of body weight to kill 50% of the test organisms in a toxicity test (usually white male rats) when administered orally (ingested).

The greater the dose of a specific chemical (the amount absorbed), the greater the risk of injury. Dose is dependent on the absolute amount of the pesticide absorbed relative to the weight of the person. Therefore, small amounts of a pesticide might produce illness in a small child while the same dose of the same chemical in an adult might be relatively harmless.

For further information on toxicity, refer to: https://www.pubs.ext.vt.edu/ENTO/ENTO-389/ENTO-389.html.

Route of Absorption

Swallowing a pesticide usually creates the most serious problem. In practice, however, the most common route of absorption of pesticides is through the skin (dermal). The most toxic pesticides have resulted in death when absorbed through this route of exposure. This is why it is very important to wear protective clothing.

Duration of Exposure

In general, the longer you are exposed to a pesticide, the higher the level in the body. There is a point at which an equilibrium will develop between the intake and the output (the level will no longer continue to increase). This point may be either above or below the known toxic level.

Physical and Chemical Properties

The distribution and rates of breakdown of pesticides in the environment can significantly alter the likelihood that injury might occur.

Population at Risk

Persons who run the greatest risk of poisoning are those whose exposure is highest, such as users who handle or apply pesticides. However, the general public also faces the possibility of exposure.

Avoiding Exposure

Exposure is the key to creating a hazard with any toxin. Pesticides are no different. Without exposure you can't be poisoned. So avoiding exposure is the most important thing pesticide applicators can do to protect themselves. To protect yourself, you should wear the protective clothing and and equipment that is listed on the pesticide product label. Also, limit your handling of pesticides as much as possible. Purchasing formulations which pose less risk in handling are worth the extra expense over a formulation which is harder to handle. For example, ready-to-use formulations like pre-mixed liquid sprays and granules pose less risk to the applicator since no mixing is required. Some liquid concentrates are sold with measuring devices built into the packaging, which can also reduce exposure.

To protect yourself, you should wear the following protective clothing and equipment:

Eye Protection

You should wear chemical splash-proof goggles anytime you are mixing pesticides or where spray can come into contact with your eyes. Your eyes are extremely vulnerable to pesticide exposure. Most chemicals are eye irritants. You can purchase a pair of these types of goggles at most hardware stores. The cost is about $10.00.

Gloves

You should never handle a pesticide without using a pair of **unlined** chemical-resistant gloves. Gloves should be resistant to chemical permeation (chemical entering through the glove surfaces). Look for gloves made of nitrile or neoprene that will cover the upper forearms. Dispose of nitrile and neoprene gloves after one week of use. If you can't find these types of gloves, purchase a similar pair of vinyl gloves. Dispose of vinyl gloves after each use, because they can be permeated by chemical residues very easily. **Do not use** cloth or leather gloves. **Do not use** natural rubber or latex rubber gloves unless it is an emergency situation. Chemicals can penetrate rubber gloves within a very short period of time and some people have allergic reactions to latex. A good set of chemical-resistant gloves can be purchased at most hardware stores for less than $10.00 per pair.

Clothing

For most pesticides **marketed for home use**, you don't need any special clothing. However, you should read the label carefully to confirm this point. At minimum, **always** wear a long-sleeved shirt, long pants, socks, and shoes. You should **never** apply a pesticide in typical summer attire such as shorts and T-shirt. Remember, most pesticide exposure is through the skin. You should protect your skin at all costs. If you use coveralls, make sure they are approved for chemical use. If they are cloth, make sure you launder them after each use. Never wash these items in the same load as your regular family wash; they must be laundered separately (see specific instructions below).

Boots

You should wear chemical-resistant boots (preferably neoprene pull-over boots) anytime you must walk through sprayed areas or where concentrate or spray can come in contact with your shoes or feet. You should **not** wear leather or cloth shoes because if they become contaminated, these items **cannot** be cleaned to rid them of pesticide residues.

Other Devices

If you are mixing concentrates, you should consider using an apron. Aprons made of nitrile, neoprene, or vinyl provide an extra measure of protection when mixing and can prevent contamination of clothing you might need to wear for a long period during application.

A Word About Respirators:

Although professional applicators routinely use respirators to protect themselves, mostly because they work with pesticides daily, they are usually trained in the use of these devices. Respirators do not all fit the same. In addition, they must be properly stored and maintained to work well. If you have a beard, they will not offer the level of protection needed. Most home use pesticides do not call for respirator use. If the pesticide you are using indicates you should use a respirator, it might **not** be a chemical designed for consumer use. **Do not use pesticides designed for agricultural and commercial use around your home. You are asking for trouble if you do!**

Again, remember these recommendations are general in nature. Please read the pesticide label to determine the type of protective devices you need to wear.

Cleaning Up Yourself and Your Pesticide Contaminated Clothing After an Application

Wash Yourself Thoroughly to Remove Residues from Your Skin

After using a pesticide, you should take steps to decontaminate yourself. Rinse off your shoes and gloves. Remove them and your contaminated clothing in a mud room or garage and clean up immediately. Put your contaminated clothing in a plastic garbage bag. Be sure to mark this bag and seal it to prevent others from coming into contact with the contaminated items. If you spilled concentrates or heavily soaked your clothes with dilute pesticides, you should throw them in the garbage using the same bag. Otherwise, the bag of clothing should be set aside for later laundering—**separately from your family wash.**

You should immediately shower and shampoo thoroughly. Use plenty of hot water and soap. Take the towel you use to dry off with to the laundry for washing (don't leave it in the bathroom for others to use!). Go back outside to check if you put everything away properly, including your boots, gloves, aprons, and goggles. These items should also be cleaned properly before you store them or use them again. Make sure you wear chemical-resistant gloves when handling and cleaning these items. Wash any areas of your skin or clothing after cleaning these items if they come in contact with the contaminated items or wash water.

Laundering Your Pesticide-Contaminated Clothing

Introducing pesticide-contaminated clothing into your family laundry presents a special hazard to you and the other members of your household. The pesticides on these pieces of clothing can be transferred to other clothing during the washing process. Please follow the instructions below carefully to prevent exposing you or your family to pesticide residues in the laundry.

Laundering Information for Pesticide-Contaminated Clothing - Before you begin, read the pesticide label to check for any statements regarding laundering. If no such information exists, then follow the recommendations contained in this guide. Also, check the label for toxicity information. Clothing that is contaminated with highly toxic and/or concentrated pesticides must be handled carefully since pesticides can be easily absorbed through the skin.

Discard any clothes that have been completely saturated with concentrated pesticides.

Laundering Recommendations (Cotton or Denim Fabric) - Wash contaminated clothing separately from the family wash. Pesticide residues are transferred from contaminated clothing to other clothing when they are laundered together.

Pre-rinsing contaminated clothing before washing will help remove pesticide particles from the fabric. Pre-rinsing can be done by:

1) Pre-soaking in a suitable container prior to washing to dislodge the particles;
2) Pre-rinsing with agitation in an automatic washing machine, and;
3) Spraying/hosing garments outdoors.

Clothing worn while using low-toxicity pesticides may be effectively laundered in one machine washing. It is strongly recommended that multiple washings be used on clothing contaminated with pesticides to draw out excess residues. Always wear chemical-resistant gloves when **handling contaminated clothing** to prevent pesticide absorption into the body.

Washing in hot water removes more pesticide from the clothing than in other water temperatures. Avoid cold water washing. Although cold water washing might save energy, cold water temperatures are relatively ineffective in removing pesticides from clothing.

Heavy-duty liquid detergents are the most effective for laundering pesticide- contaminated clothing. This is especially important if the pesticide used was an emulsifiable concentrate. Emulsifiable concentrate formulations are oil-based, and heavy-duty liquid detergents are known for their oil-removing ability.

Laundry additives, such as bleach or ammonia, do not contribute to the removal of pesticide residues. Either of these additives may be used, if desired, but caution must be used. Bleach should never be added to or mixed with ammonia, because they react together to form a **very toxic chlorine gas**. **Do not mix ammonia and bleach**.

If several garments have become contaminated, wash only one or two garments in a single load. Wash garments contaminated by the same pesticide(s) together. Launder using a full water level to allow the water to thoroughly flush the fabric.

Clothing exposed to pesticides should be laundered the same day. This is especially true with highly toxic or concentrated pesticides. It is much easier to remove pesticides from clothing by daily laundering than attempting to remove residues that have accumulated over a period of time.

Pesticide carry-over to subsequent laundry loads is possible because the washing machine is likely to retain residues. It is important to rinse the washing machine with an "empty load," using hot water and the same detergent, machine settings, and cycles used after laundering contaminated clothing.

Line-drying is recommended for these items. Although heat from an automatic dryer might create additional chemical breakdown of pesticide residues, many pesticides break down when exposed to sunlight. This also eliminates the possibility of residues collecting in the dryer.

Laundering Recommendations (Nitrile, Neoprene, or PVC) - Laundering this type of outer protective clothing is different from other types. It should be pan-washed in warm water (less than 110°F) using a good detergent. Double or triple washing of heavily contaminated outer protective clothing is desirable. Rinse through two water changes and hang up to air dry. Outer protective clothing should be washed after each exposure or use.

Gloves must be thoroughly pan-washed inside and out using a good detergent with several rinses. Remember, gloves must be

clean inside because they will be in contact with your skin. Wash **chemical-resistant boots** similarly to gloves.

Respirators require special care. Wash inside with a cloth, detergent, and warm water. Change filters according to instructions on the original container. Keep the respirator in a plastic bag, original container, or some other suitable container when it is not being used. Keep the respirator properly adjusted to your face. Filters and prefilters should be kept sealed in a plastic bag when not in use. Filters should be changed regularly according to ratings and amount of use.

Goggles should be washed gently using a mild detergent so as not to scratch the lenses.

Give all of your protective clothing and equipment the best of care. They may save your life.

Chemical Emergencies

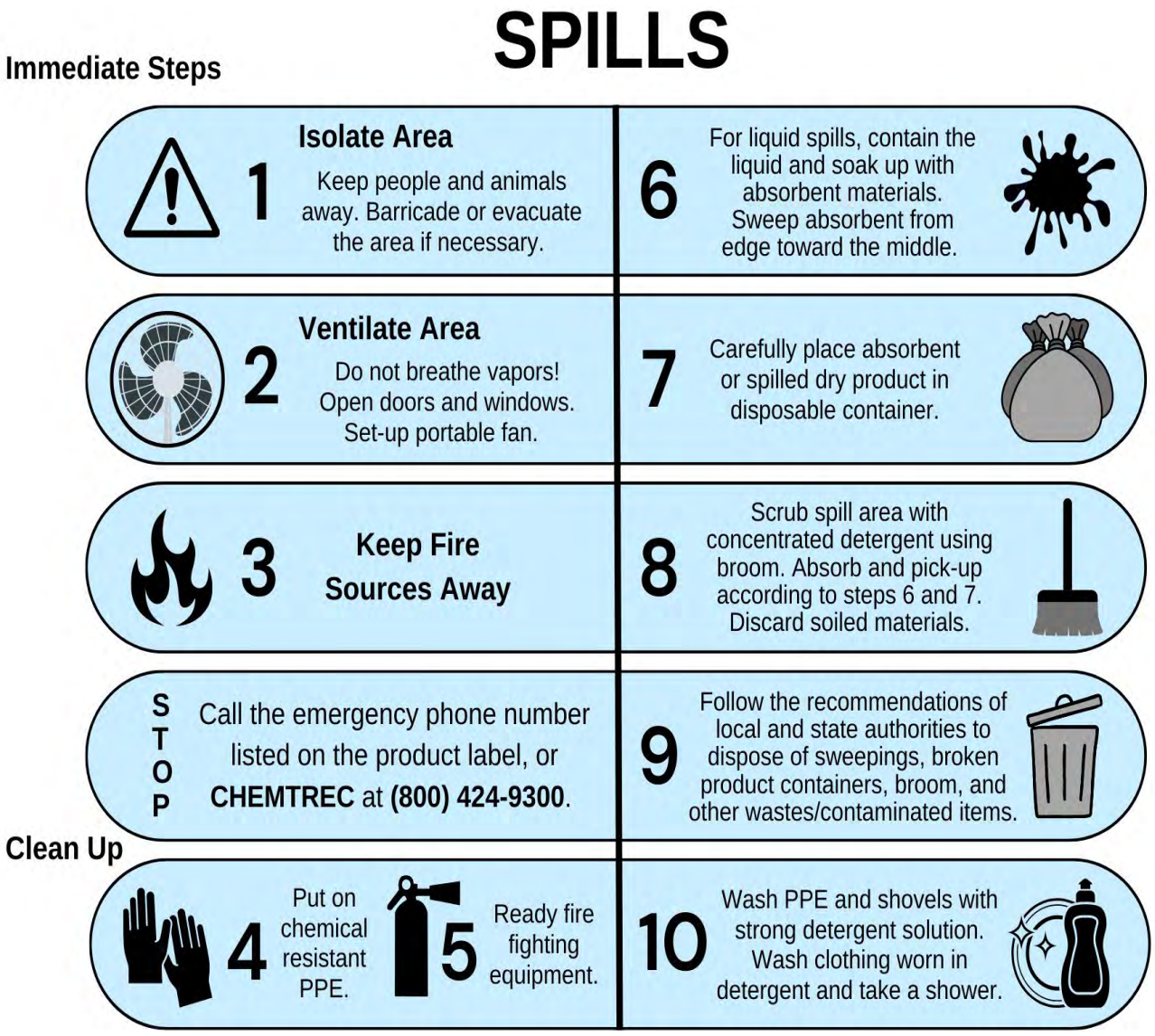
What happens if you spill a pesticide?

Every pesticide spill situation varies, but there are some basic procedures you can follow to protect you and your family if a spill emergency occurs. Spills occur due to breakage of glass containers, tipping open containers during mixing and handling, and sometimes from poor storage conditions. Avoid these situations and you will avoid most spill emergencies.

Some measures you can take to reduce the hazards of a spill include:

- Review your pest control priorities to determine if you need to use or store a pesticide in the first place.
- Don't buy large containers or glass containers that break easily.
- Avoid liquid formulations if possible.
- Use ready-to-use products to avoid storing or handling concentrates.
- Don't store pesticides in your living areas or where vapors from a spill can enter your home in some way.
- Don't place containers where they will be easily knocked onto the floor and broken.
- Don't store pesticides where heat or cold will cause chemicals to react or rupture containers.
- Don't store containers where they will become wet or damaged.

The following diagram provides a 10-step process that works for most home and garden chemicals. If you have any doubts, contact the chemical manufacturer, your local Extension agent, or the groups listed in the Virginia Pesticide Information Directory (to follow).



Chemical Spill Kit

Here is a list of supplies you will need to handle most chemical spills. Try to keep these items handy if you store pesticides in your home.

- chemical resistant gloves *[2 pairs made from nitrile or neoprene—if you can't get these, rubber or vinyl will work but be careful since some chemicals can permeate (dissolve and enter through the glove surfaces) these materials easily]*
- chemical resistant boots (*1 pair made from neoprene rubber, or vinyl—again be careful about permeation)*
- absorbent material (*1 large bag of kitty litter or other commercially available absorbent)*
- detergent *(strong household type such as Tide or All will work)*
- disposable pail *(a 5-gallon bucket will work—this is a good place to store most of the items in a spill kit)*
- disposable plastic bags *(2 heavy-duty garden type bags)*
- broom (*household type with natural bristles)*
- scoop or shovel
- fire extinguisher [*10 lb.—rated for chemical fires (A B & C type fires)]*

What happens if you or a member of your family is exposed to or poisoned by a pesticide?

Pesticide poisonings can occur through careless handling, through accidental ingestion, and by contact with treated surfaces, containers, and application equipment. Many accidents can be prevented by careful handling, storage, and selection of safer products. Never store or leave pesticides where children, uninformed adults, or pets can contact them. Never leave a sprayer unattended or allow others to enter a treated area until the sprayed area is safe to reenter according to the label instructions.

Follow these directions if an exposure occurs

- **Follow the first aid recommendations on the label.** Often quick action on the scene can do more to help a victim than can be done by waiting for emergency personnel to arrive. Remember, the first aid instructions are usually directed to the layman at the scene. Your response to these recommendations could save a life or prevent long-term injury. This is especially important when chemicals splash into the eyes—fast action to rinse out an eye during the first 15-20 minutes can prevent possible permanent damage. One word of caution—be careful to avoid exposure to yourself when handling a poisoned victim.
- **Call your physician immediately.** If your family physician is not available, the patient should be taken to the nearest hospital emergency room along with the pesticide label or a clear photo of it.
- If necessary, the physician will call the nearest poison control center for further information on the suspected poisoning agent, treatment, and prognosis.
- **If you have questions specific to a possible poisoning, you can call a Poison Control Center for information. Please refer to the list below for Poison Control Centers and other emergency contacts.**

Poison Information and Treatment Resources For Virginians

Regional Poison Control Centers

Provide 24-hour information and consultation services by Poison Information Specialists and board-certified Medical Toxicologists. Located in hospitals equipped for all toxicologic (poison) emergencies.

CHARLOTTESVILLE, VA
Blue Ridge Poison Center
University of Virginia School of Medicine
1222 Jefferson Park Ave.
P.O. Box 800774
Charlottesville, VA 22903
(800) 222-1222
https://med.virginia.edu/brpc

CHARLESTON, WV
West Virginia Poison Center
Robert C. Byrd Health Sciences Center
3110 MacCorkle Ave., S.E.
Charleston, WV 25304
(800) 222-1222
www.wvpoisoncenter.org

WASHINGTON, DC
National Capital Poison Center
3201 New Mexico Ave., NW
Suite 310
Washington, DC 20016
(800) 222-1222
www.poison.org

CHARLOTTE, NC
Carolinas Poison Center
Atrium Health
P.O. Box 32861
Charlotte, NC 28232-2861
(800) 222-1222
https://www.ncpoisoncontrol.org

RICHMOND, VA
Virginia Poison Center
VCU Health System
Virginia Commonwealth University
830 East Main Street, Suite 300
P.O. Box 980522
Richmond, VA 23298-0522
(800) 222-1222
https://poison.vcu.edu

National Poison Control Center
Toll-free number for all U.S.:

(800) 222-1222

Calls to this number will be routed to the closest
Regional/Area Poison Control Center.
Website for the America's Association of Poison Centers is:

https://poisoncenters.org

Applying the Correct Amount in the Right Place

Applying the correct amount of pesticide to the target site is critical for proper pest control. Using the right equipment for the job is an important first step toward achieving this task. Your choice of equipment can be as simple as using an aerosol or granular applicator supplied with the product, or as complex as using a pull behind or utility sprayer for a large area. In each situation, the application equipment must be in good working order and calibrated to put down the correct amount. Ask your Extension agent for publications and assistance with calibration of larger pieces of equipment and backpack sprayers.

Proper Measuring and Mixing

To mix a concentrated formulation of a pesticide, you must first determine (according to label directions) how much concentrate to dilute with water or some other diluent. You can use the conversion charts and other pieces of information in the Reference Tables (to follow) to help you with some measurements. Determining the correct amount to mix is usually just a combination of simple math and knowing the units of measurement.

For example, the product label says, "For the control of aphids on tomatoes, mix 8 fluid ounces of pesticide concentrate into 1 gallon of water and spray the foliage until wet." By filling your sprayer with water and testing the output on your garden, you know that your six tomato plants require only one quart of dilute pesticide to cover their foliage. So you need only 2 fluid ounces of pesticide concentrate mixed in one quart of water to do the job. Why? Because a quart is one-fourth of a gallon, and 2 fluid ounces mixed into a quart make the same strength spray recommended by the label, but in a quantity that can be used all at once.

Consumers can solve similar problems by using careful math, good measurements, and use of the reference information here and in the tables at the end of this section of the guide.

Helpful Hints

If you need to determine the size of a square or rectangular area, such as a lawn for herbicide application, measure and multiply the length times the width. For example, an area 10 feet long by 8 feet wide contains 80 square feet of area. Common area measurements may involve square yards (1 square yard = 9 square feet) or square feet (1 square foot = 144 square inches).

If you need to determine the volume of a space such as a room, measure and multiply the room's length, width, and height. For example, a space 10 feet long, 8 feet wide, and 8 feet high contains a volume of 640 cubic feet. You would use this procedure, for instance, for an aerosol release to control cockroaches.

Most home-use pesticides are measured in terms of volume. Some common equivalents include:

1 gallon (gal.)	=	128 fluid ounces (fl. oz.)
	=	4 quarts
	=	8 pints
	=	16 cups
1 quart (qt.)	=	32 fl. oz.
	=	2 pints
	=	4 cups
1 pint (pt.)	=	16 fl. oz.
	=	2 cups
1 cup	=	8 fl. oz.
1 tablespoon (tbsp)	=	1/2 fl.oz.
	=	3 teaspoons (tsp)
1 teaspoon (tsp)	=	1/6 fl.oz.

In measuring teaspoons or tablespoons of pesticide, use only level spoonfuls, and never use the same measuring devices for food preparation.

The following table provides examples to help you convert label information to your specific use situations. "Amount" can be any measure of pesticide quantity. However, the same unit of measure must be used on both sides of the chart. For example, 8 fluid ounces per gallon of water is equivalent to 2 fluid ounces per quart of water.

Not all dosage rates are included in the examples given here. For rates not included, remember that a pesticide that is diluted with water proportionally changes the quantity of pesticides and the area, volume, or number of items treated. For example, one-half pound per 1,000 square feet is equivalent to one-quarter pound per 500 square feet. Likewise, one-half pound of pesticide in 1 gallon of water applied to 1,000 square feet is equivalent to 1 pound of pesticide in 2 gallons of water applied to 2,000 square feet.

There is a point at which measurements needed for smaller quantities of pesticides are too minute to be accurately measured with typical domestic measuring devices. In such cases, the user can either mix the larger volume, realizing that there will be leftover material; obtain a more accurate measuring device, such as a graduated cylinder or a scale which measures small quantities; or search for an alternative pesticide or less concentrated formulation of the same pesticide.

Table 1.2 - Conversion Table

Pesticide Label Says Mix			**Amount of Pesticide Per**		
Amount Pesticide	**Per**		**1 qt. water**	**1 pt. water**	
8 units	1 gal. water	**equals**	2 units	1 unit	
16 units	1 gal. water	**equals**	4 units	2 units	
32 units	1 gal. water	**equals**	8 units	4 units	
128 units	1 gal. water	**equals**	32 units	16 units	
Pesticide Label Says Apply			**Amount of Pesticide Per**		
Amount Pesticide	**Per**		**20,000 sq. ft.**	**10,000 sq. ft.**	**500 sq. ft.**
1 unit	1,000 sq. ft.	**equals**	20 units	10 unit	1/2 unit
2 units	1,000 sq. ft.	**equals**	40 units	20 units	1 unit
5 units	1,000 sq. ft.	**equals**	100 units	50 units	2 1/2 units
10 units	1,000 sq. ft.	**equals**	200 units	100 units	5 units
Pesticide Label Says Release				**Cans Per**	
Aerosol Cans	**Per**		**20,000 cu. ft.**	**10,000 cu. ft.**	**5,000 cu. ft.**
1	10,000 sq. ft.	**equals**	2	1	don't use
1	5,000 sq. ft.	**equals**	4	2	1
1	2,500 sq. ft.	**equals**	8	4	2

Table 1.3 - Table of Weights, Measures, and Dilutions

Weights:
28.35 grams = 1 ounce
16 ounces = 1 pound = 453.6 grams
1 pint of water = 1.04 pounds
1 gallon of water = 8.34 pounds
1000 micrograms = 1 milligram
1000 milligrams = 1 gram = 0.035 ounce avoirdupois
1000 grams = 1 kilogram = 2.2 pounds

Volume And Liquid Measure:
3 teaspoons = 1 tablespoon = 14.8 cubic centimeters (cc)
2 tablespoons = 1 fluid ounce = 29.6 cc
8 fluid ounces = 16 tablespoons = 1 cup = 236.6 cc = 1/2 pint
2 cups = 32 tablespoons = 1 pint = 473.1 cc = 16 fluid ounces
2 pints = 64 tablespoons = 1 quart = 946.2 cc = 0.946 liter
4 quarts = 256 tablespoons = 1 gallon = 3785 cc
1 gallon = 128 fluid ounces = 231 cubic inches = 3785 cc
1 milliliter (ml) = 1 cubic centimeter = 0.034 fluid ounces
1000 milliliters = 1 liter = approximately 1 quart, 1 fluid ounce
1 liter of water = 1 kilogram
1 bushel soil = 1.25 cubic feet

Land Measure:
43,560 square feet = 1 acre = 0.404 hectare
1 mile = 5280 feet = 1609.35 meters
10 millimeters = 1 centimeter = 0.3937 inches
100 centimeters = 1 meter = 39.37 inches

Length Of Row Required For One Acre:

Row Spacing	*Length or Distance*
24 inch	7260 yards = 21,780 feet
30 inch	5808 yards = 17,424 feet
36 inch	4840 yards = 14,520 feet
40 inch	4356 yards = 13,069 feet
42 inch	4149 yards = 12,446 feet
48 inch	3630 yards = 10,890 feet

Dilutions:

1 part per million (ppm)	= 1 milligram per liter
	= 1 milligram per kilogram
	= 0.0001 percent
	= 0.013 ounce by weight in 100 gal
1 percent	= 10,000 parts per million
	= 10 grams per liter
	= 1.29 ounces by weight per gallon
	= 8 pounds per 100 gallons

Temperature:
To change temperature in degrees Celsius to temperature in degrees Fahrenheit, multiply Celsius by 9/5 and add 32.
Example: 30 degrees Celsius = 30 x 9/5 + 32 = 86 degrees Fahrenheit.

Abbreviations:
Formulations:
A = aerosol
B = bait
C = concentrate
D = dust
E or EC = emulsifiable concentrate
F = flowable
G = granules or granular
L = liquid
LC = liquid concentrate
M = microencapsulated
P = pellet
RTU = ready-to-use
S = solution
SP = soluble powder
ULV = ultra-low volume
W or WP = wettable powder
WDG = water dispersible granule
WS = water soluble
WSP = water-soluble powder or water-soluble packet

Pesticide Calibration Tables

Table 1.4 - Travel Speed Chart

Time Required in Seconds to Travel			
Miles per Hour	**100 ft**	**200 ft**	**300 ft**
1	68	136	205
2	34	68	102
3	23	46	68
4	17	34	51
5	14	27	41
6	11	23	34
7	10	20	29
8	9	17	26
9	8	15	23
10	7	14	21

1 mph = 88 feet per minute
1 mph = 1.466 feet per second
Speed in mph = Number of 35-inch steps per minute/30

Table 1.5 - Equivalent Quantities of Dry Materials (Wettable Powders) for Various Quantities of Water

Water	**Quantity of Material**					
100 gal[1]	1.0 lb	2.0 lb	3.0 lb	4.0 lb[1]	5.0 lb	6.0 lb
50 gal	8.0 oz	1.0 lb	1.50 lb	2.0 lb	2.50 lb	3.0 lb
5 gal[1]	0.80 oz (3 tbsp)[2]	1.60 oz	2.40 oz	3.20 oz[1]	4.00 oz	4.8 oz
1 gal	0.16 oz (2 tsp)[2]	0.32 oz (3 tsp)[2]	0.48 oz (1 1/2 tbsp)[2]	0.64 oz (2 tbsp)[2]	0.80 oz (3 tbsp)[2]	0.96 oz (3 tbsp)[2]

[1]**Example**: If a recommendation calls for a mixture of 4 pounds of wettable powder to 100 gallons of water, it would take 3-1/4 ounces to 5 gallons of water to give 5 gallons of spray mixture of approximately the same strength.

[2]**Note**: Wettable pesticide materials vary considerably in density. Therefore the teaspoonful (tsp) and tablespoonful (tbsp) measurements in this table are approximate but not exact dosages by weight. However, we believe that they are within the bounds of safety and efficacy for mixing small amounts of spray.

Table 1.6 - Equivalent Quantities of Liquid Materials (Emulsifiable Concentrates, etc.) for Various Quantities of Water

Water	**Quantity of Material**					
100 gal[1]	1/2 pt	1.0 pt	2.0 pt	3.0 pt	4.0 pt[1]	5.0 pt
50 gal	4.0 fl oz	8.0 fl oz	1.0 pt	24.0 fl oz	1.0 qt	2 1/2 pt
5 gal	0.40 fl oz (1 tbsp)[2]	0.80 fl oz	1.60 fl oz	2.40 fl oz	3.20 fl oz	4.0 fl oz
1 gal[1]	0.08 fl oz (1/2 tsp)[2]	0.16 fl oz (1 tsp)[2]	0.32 fl oz (2 tsp)[2]	0.48 fl oz (3 tsp)[2]	0.64 fl oz (4 tsp)[2]	0.80 fl oz (5 tsp)[2]

[1]**Example**: If 4 pints of a liquid concentrate is recommended to 100 gallons of water, 4 teaspoons of the chemical in 1 gallon of water will give a mixture of approximately the same strength.

[2]Approximate figure.

Decontaminating Sprayers

If you use your sprayer for an herbicide application (such as spraying herbicides like 2,4-D on your lawn) and later use it to apply an insecticide application on your garden or shrubs, you could kill those vegetables and ornamentals. You cannot totally decontaminate a sprayer of phenoxy herbicides. For this type of situation you should buy two sprayers; one for herbicides and another for other pesticide applications. You should clearly mark these sprayers accordingly. For other herbicides and for spraying less sensitive plants, you can use the same sprayer after cleaning it properly.

Cleaning a Sprayer

Immediately after application, you should flush the sprayer with water and spray this water on a site that is listed on the label. Rinse several more times with water before storing; additionally, rinse the sprayer with water at least once immediately before reusing. Most pesticide formulations can be removed by repeated washing with water.

Storage

Pesticide storage at home should be kept to a minimum. Often, buyers of home pesticides are tempted to purchase concentrated formulations because they cost less per dosage to mix and use. Unfortunately, most of us never think about the rest of the bottle. As a result, we often end up storing these chemicals somewhere in our homes or in an outside shed where the chemical will freeze or heat up and be rendered useless within a few years. You should:

- Select products that are ready-to-use or are marketed with limited packaging and in amounts to only carry you through the current use season.
- Store pesticides in a locked cabinet away from children and pets. The storage cabinet should be separated from other household items and should never be located in the living areas of the home. Never put pesticides in a cabinet with, or near, food, medical supplies, or cleaning materials.
- Always store pesticides in their original containers. Labels should be protected to prevent damage and to remain readable. Never transfer pesticides into other containers unless the original container is damaged. Never use drink bottles or other containers that children and others may associate with something to eat or drink. If you must transfer chemicals because of a broken container, make sure you remove the original label and place it on the replacement container. Always refasten child-proof closures and lids.
- Avoid storing pesticides in places where flooding is possible, or in open places where they might spill or leak into the environment. If you have any doubt about the content of a container, dispose of it using the directions below.

Disposal

The best way to dispose of a small, excess amount of pesticide is to use it—apply it according to label directions. If you cannot use it, ask a neighbor whether he or she can use it. If all the pesticide cannot be used, first check with your local solid waste management authority to determine whether your community has a household hazardous waste collection program or any other program for handling disposal of pesticides. Several communities in Virginia have sponsored these programs in the past. If you live on a farm or have purchased an old farm and have leftover pesticides that were left from previous farming operations, you should contact your local Extension agent to determine if your locality is holding a pesticide waste collection program for leftover farm chemicals.

- Do not pour leftover pesticides down the sink or into the toilet. Chemicals in pesticides could interfere with the operation of wastewater treatment systems and pollute waterways because many municipal systems cannot remove all pesticide residues.
- An empty pesticide container can be as hazardous as a full one because of residues remaining inside. When empty, a pesticide container should be triple rinsed and disposed of according to the pesticide label directions.
- Do not puncture or burn pressurized product containers—they could explode.
- If you have any doubts about proper pesticide disposal, contact your solid-waste management agency or other sources of assistance referenced on the pesticide label.

For further information on pesticide storage and disposal, please see:

Pesticide Storage & Disposal - A Quick Guide for Home Use https://www.pubs.ext.vt.edu/ENTO/ENTO-385/ENTO-385.html.

Additional Information

1. Virginia Tech Pesticide Programs. (2020). *The Virginia Core Manual: Applying Pesticides Correctly*. Blacksburg, VA: Virginia Cooperative Extension.
2. Helfrich, L. A., Weigmann, D. L., Hipkins, P., & Stinson, E. R. (2009). *Pesticides and Aquatic Animals: A Guide to Reducing Impacts on Aquatic Systems*. Virginia Cooperative Extension. Retrieved from https://vtechworks.lib.vt.edu/handle/10919/48060.
3. Whitford, F., Miller, B., Bennett, R., Jones, M., & Bledsoe, L. (2008). Pesticides and Wildlife: An Introduction to Testing, Registration, and Risk Management. *Purdue Pesticide Programs*. Retrieved from https://ag.purdue.edu/department/extension/ppp/ppp-publications/ppp-30.pdf.
4. Environmental Protection Agency (2005). Citizen's Guide to Pest Control and Pesticide Safety. *U.S. EPA – Prevention, Pesticides and Toxic Substances*. Retrieved from https://www.epa.gov/safepestcontrol/citizens-guide-pest-control-and-pesticide-safety.

Table 1.7 - Toxicity Data for Some Common Pesticides Used in Home Grounds and Animals

Fungicides

Pesticide Active Ingredient	Humans	Soils	Water	Birds	Mammals	Earthworms	Fish	Bees
captan	L	24	L	N	L	L	H	N
chlorothalonil	L	30	L	L	L	M	H	H
copper sulfate	M	-	H	M	M	L	H	N
mancozeb	L	7	H	L	L	L	H	N
sulfur	N	-	L	N	N	-	N	N

Herbicides

Pesticide Active Ingredient	Humans	Soils	Water	Birds	Mammals	Earthworms	Fish	Bees
2,4-D amine	M	10	M	M	M	L	L	N
glyphosate	L	47	N	L	L	L	L	N
MCPA	L	120	H	M	L	L	M	N
mecoprop-P	L	60	H	M	L	L	L	-
pendimethalin	L	120	L	L	L	L	M	L
triclopyr	L	46	H	L	L	L	M	-

Insecticides

Pesticide Active Ingredient	Humans	Soils	Water	Birds	Mammals	Earthworms	Fish	Bees
acephate	L	10	L	M	M	-	L	H
Bacillus thuringiensis (BT)	N	-	N	N	L	N	N	N
bifenthrin	M	varies	L	L	M	-	H	H
carbaryl	M	16	M	L	M	EH	M	H
cypermethrin	M	60	L	L	M	H	H	H
imidacloprid	M	varies	L	L	M	-	L	H
malathion	L	10	L	M	L	L	H	H
metaldehyde	M	-	L	L	M	-	L	L
pyrethrins	L	10	L	L	L	L	EH	H
soap, insecticidal (Safer Soap)	N	-	N	N	N	-	N	L
spinosad	L	9-17	M	L	L	M	M	H

Humans: based on oral LD50 in rats
Soils: half-life in soils (number of days)
Water: highest of either runoff or leaching potential
Birds: based on LD50 to most sensitive species
Mammals: based on oral LD50 in rats
Earthworms: based on test results
Fish: based on oral LC50 on most sensitive species
Bees: based on article on bee hazards by R. D. Fell

EH: Extremely high hazard rating
H: High hazard rating
M: Moderate hazard rating
L: Low hazard rating
N: No hazard rating
(*): Highly toxic to aquatic invertebrates
(-): means data unavailable

Virginia Pesticide Information Directory

This directory is intended for use by persons who need assistance with general and emergency pesticide-related information. We hope that it will save time and money by directing you to the proper government and industry sources.

The pages to follow are broken down into **EMERGENCY** and **GENERAL INFORMATION**. In the blank lines provided, please take time to list your local phone numbers for these sources. In the case of an emergency, it might save a life or avoid added expense and inconvenience. Keep a copy of this guide, with this directory section marked, near your phone for future reference.

For emergency information about an agricultural chemical, please refer to a current product label or call CHEMTREC at (800) 424-9300 or (800) 262-8200.

Emergency Information

Treatment for Poisonings: If poisoned, have someone take you immediately to your nearest emergency room with the label of the container.

The blanks below are supplied for recording the name and telephone number of the nearest poison control center. Please refer to the Regional and Area Poison Control Centers listed previously.

My nearest poison control center is located at:

_____

_____

Phone Number: _____

Emergency Information		
Spills, Leaks, Exposure, Fire, accidents, and other related emergencies	CHEMTREC (for assistance) Chemical Transportation Emergency Center Industry assistance with clean-up procedures, etc. www.chemtrec.com/	**(800) 424-9300 or (800) 262-8200** (call day or night)
Accidents Or Incidents that constitute a threat to any person, public safety and health, or the environment must be reported to:	Virginia Department of Agriculture and Consumer Services Office of Pesticide Services Field Operations	**(804) 371-6560**
For Assistance With Spills And Emergencies take time to jot down your local emergency numbers in the space provided	State Police _____ Fire Department _____ Ambulance _____	**911**

General Information

General Information	**Virginia Tech** **Your Local Extension Office** https://ext.vt.edu/offices.html **Virginia Tech Pesticide Programs** Blacksburg, VA 24061 (0409) vtpp.ento.vt.edu or vtpp.org.	 **(540) 231-6543**
Regulatory Information including permit or license information and reporting pesticide missuse.	**Virginia Dept. of Agriculture and Consumer Services** Office of Pesticide Services 102 Governor Street, Lower Level Richmond, VA 23219 www.vdacs.virginia.gov/pesticides.shtml	**(804) 786-3798**
Hazardous Waste Disposal Information (Follow label directions first, call for help only after reading label carefully.)	**Virginia Department of Environmental Quality** 1111 East Main Street, Suite 1400 P.O. Box 1105 Richmond, VA 23219 https://www.deq.virginia.gov/our-programs/land-waste/solid-hazardous-waste/hazardous-waste	**(804) 698-4000** **(800) 592-5482**
Pesticide Information Dealing with pesticide chemistry and toxicology	**National Pesticide Information Center (NPIC)** Oregon State University 310 Weniger Hall Corvallis, OR 97331-6502 http://npic.orst.edu/	**(800) 858-7378** **Monday - Friday** **8:00 AM - 12:00 PM PT** **11:00 AM - 3:00 PM ET**
Citizen's Assistance general consumer-related information and complaints	**U.S. Consumer Product Safety Commission** https://www.cpsc.gov/	**(800) 638-2772** **(800) 638-8270 TTY** **8:00 AM - 5:30 PM ET**
Animal Poisonings Assistance (Emergency Services)	**Virginia-Maryland Regional College Of Veterinary Medicine** Virginia Tech (0442) 205 Duck Pond Drive Blacksburg, VA 24061 https://www.vetmed.vt.edu/ **ASPCA Animal Poison Control Center** https://www.aspca.org/pet-care/animal-poison-control	**(540) 231-4621** **(Your veterinarian may contact this number 24 hours a day for consultation.)** **540-231-7666 (SWITCHBOARD)** **(888) 426-4435**
Toxicology Information	**Virginia Department of Health Toxic Substances Information** 109 Governor Street, P.O. Box 2448 Richmond, VA 23219 https://www.vdh.virginia.gov/environmental-health/public-health-toxicology/	**(804) 864-8182**
For Information on drinking water regulations and pesticides in drinking water	**EPA Safe Drinking Water Hotline** https://www.epa.gov/ground-water-and-drinking-water	**(800) 426-4791** **Monday - Friday** **9:00 AM - 4:00 PM ET**

Also try EPA's Home Page for more consumer information on pesticides at https://www.epa.gov/safepestcontrol.

Professional Associations

National Pest Management Association (NPMA)
10460 North Street
Fairfax, VA 22030
(703) 352-6762
https://www.pestworld.org/

National Assocation of Landscape Professionals, Inc.
12500 Fair Lakes Circle
Suite 200
Fairfax, VA 22033
(703) 736-9666
(800) 395-2522
https://www.landscapeprofessionals.org

Virginia Nursery and Landscape Association
9702 Gayton Road
Box 163
Henrico, VA 23238
(804) 256-2700
https://vnla.org/

Virginia Pest Management Association (VPMA)
P. O. Box 7161
Fredericksburg, VA 22404
(540) 374-9200
http://www.vpmaonline.com/

Virginia Turfgrass Council (VTC)
P. O. Box 5989
Virginia Beach, VA 23471
(757) 464-1004
https://vaturf.org/

This directory neither endorses those private groups listed nor was intended to exclude groups who may be appropriate but were not listed. Those who feel that they should be included are welcome to call or write for inclusion in future revisions: Virginia Tech Pesticide Programs (MC0409), 302 Agnew Hall (Bldg. 0109), 460 West Campus Drive, Blacksburg, VA 24061, (540) 231-6543. For a more complete list of pesticide-related sites, please visit to the Virginia Tech Pesticide Programs Home Page at vtpp.ento.vt.edu (or vtpp.org).

Protecting Honey Bees

James Wilson, Extension Apiculturist, Virginia Tech Department of Entomology

Honey bees are a valuable service to apiculture and agriculture not only because of they produce honey and beeswax, but they are the most important pollinators of cultivated crops. Pesticide poisoning of honey bees, and other beneficial insects, can be a serious problem. Every effort should be made to minimize the exposure of honey bees to pesticides in treated areas.

The United States Department of Agriculture has developed a list of agricultural crops attractive to bees. If you are unsure of the risk that your crop system might have to bees, please use this USDA guide to help you determine how likely bees will be in your crops. Exposure is one of the two main components of risk, the other being toxicity of the compound in question. Additionally, while we list pesticides by toxicity and relative harm to honey bees below, the University of California IPM Center houses a searchable database with precautionary rankings. Virginia Cooperative Extension is proud to announce that we have become members of the Honey Bee Health Coalition (HBHC after this). The HBHC is "to collaboratively implement solutions that will help to achieve a healthy population of honey bees and other pollinators in the context of productive agricultural systems and thriving ecosystems." We believe that being members of this organization will help to protect our pollinators in Virginia through access to, and continued development of, critical resources like those developed with commodity and stakeholder groups. Specifically, users of this guide may benefit from the corn, and apple best management guides. These focus on pollinator management in production systems and were developed with their respective commodity boards. The guides are free for download and distribution. Please see the below table for links to each of the resources mentioned above.

Table 1.8 - Online Resources for Pollinator Protection Information

Resource	Web Link
USDA "Attractiveness of Agricultural Crops to Pollinating Bees for the Collection of Nectar and/or Pollen"	https://www.usda.gov/sites/default/files/documents/Attractiveness-of-Agriculture-Crops-to-Pollinating-Bees-Report-FINAL-Web-Version-Jan-3-2018.pdf
University of California IPM Program's Bee Precaution Pesticide Ratings	https://ipm.ucanr.edu/bee-precaution-pesticide-ratings/
The Honey Bee Health Coalition (HBHC) Resources	https://honeybeehealthcoalition.org/resource_category/best-management-practices/
HBHC Corn Best Management Practices	https://honeybeehealthcoalition.org/resources/corn-best-management-practices/
HBHC Apple Best Management Practices	https://honeybeehealthcoalition.org/resources/applebmps/

An Updated Note on Protecting Pollinators in Virginia

Federal guidelines mandate that each state develop a plan for the mitigation of pesticide exposure to managed pollinators in their own state. The plan is known as the "Voluntary Plan to Mitigate the Risk of Pesticides to Managed Pollinators" and was finalized in May of 2017.

This voluntary plan encourages an increase in communication between pesticide applicators and the managers of pollinators to reduce the potential for damaging pesticide exposure. Since this plan is voluntary there are additional guiding documents for most involved stakeholders, see table below for links. This plan has been adopted by the Commonwealth of Virginia and can be found in its entirety at the 1st link provided below. Virginia is using the Bee Check tool for beekeepers, and the Field Check tool for applicators to help reduce pesticide exposure risk (the respective sign-up links are below). Questions and comments should be directed to VDACS with the contact information given below.

Virginia's Voluntary Plan to Mitigate the Risk of Pesticides to Managed Pollinators

Link: http://www.vdacs.virginia.gov/pdf/BMP-plan.pdf.

Beekeepers can sign up for the Bee Check Program at: https://beecheck.org/signup#beekeeper.

Applicators can sign up for the Field Program at: https://driftwatch.org/signup#applicator.

Best Management Practices:

Stake Holder Category	VDACS Recommended Best Management Practices
Beekeepers	https://www.vdacs.virginia.gov/pdf/BMP-Beekeeper.pdf
Commercial Ag. Applicators	https://www.vdacs.virginia.gov/pdf/BMP-Ag-Commercial-Applicator.pdf
Agricultural Producers	https://www.vdacs.virginia.gov/pdf/BMP-Ag-Producer.pdf
Structural Pest Management	https://www.vdacs.virginia.gov/pdf/BMP-Structural-Pest-Management.pdf
Horticultural Production	https://www.vdacs.virginia.gov/pdf/BMP-Horticultural-Industry.pdf

VDACS Contact Points:

Nicole Wilkins, Program Manager
Office of Pesticide Services
nicole.wilkins@vdacs.virginia.gov
804.371.2283

Keith Tignor, State Apiarist
Office of Plant Industry Services
keith.tignor@vdacs.virginia.gov
804.786.3515

Causes of Honey Bee Poisoning

1. The majority of honey bee poisoning occurs when pesticides are applied to crops in bloom. This includes crop plants such as sweet corn, which is routinely sprayed when in tassel. Honey bees do not pollinate corn; however, they will collect pollen from corn tassels and transport it back to the honey bee hive.
2. The application of pesticides to fields with weeds in bloom. The spring application of pesticides to alfalfa fields with flowering weeds is a particular problem in Virginia.
3. The drift of toxic sprays or dusts to adjoining crops or weeds in bloom.
4. The contamination of flowering ground-cover crops in orchards treated with pesticides.
5. The contamination of water or dew on foliage and flowers. This includes the water collected by honey bees for drinking and cooling the honey bee hive.
6. The application of systemic pesticides and the potential contamination of nectar and pollen collected by foraging honey bees. The use of neonicotinoid pesticides (e.g., clothianidin, imidacloprid, and thiamethoxam) is a concern for honey bee poisoning; although, there is a need for more research evidence.

The most serious poisonings result with honey bees that collect pesticide-contaminated pollen or nectar and transport these materials to the honey bee hive. Pesticide dusts (e.g., Sevin) and encapsulated pesticides are especially dangerous. These pesticides can adhere to foraging honey bees, are transported to the hive, and stored for long periods of time. Such pesticides may cause honey bee mortality in the hive for several months.

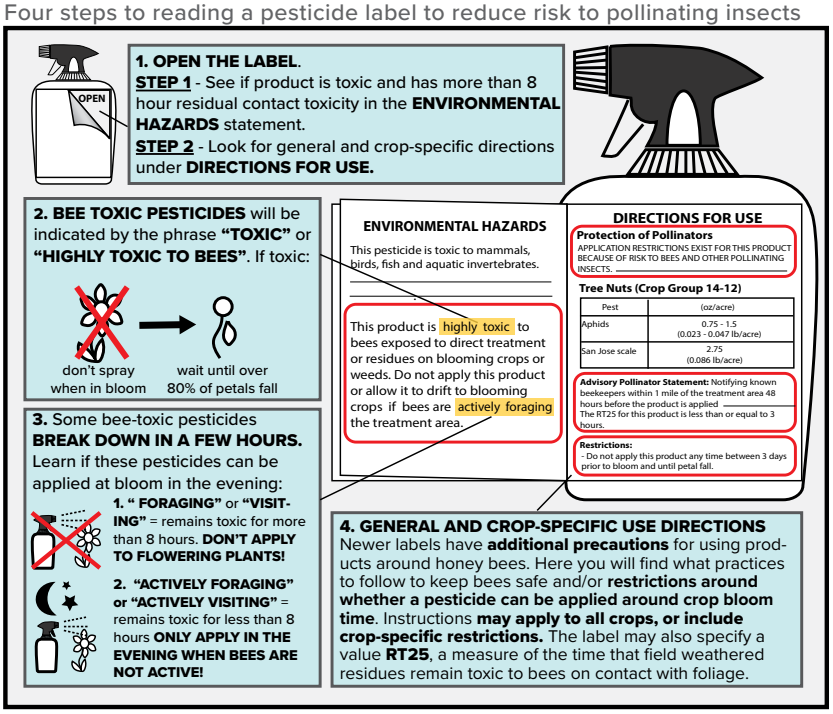
Ways to Reduce Honey Bee Poisoning

1. Contact beekeepers with honey bee hives near areas to be treated with pesticides that are hazardous to honey bees.
2. Do not apply pesticides that are toxic to honey bees on crops in bloom.
3. Use pesticides that are less toxic to honey bees when such choices are consistent with pest control recommendations (e.g., see table of relative pesticide toxicities).
4. Choose the least hazardous pesticide formulations when possible. Pesticide dusts and encapsulations are more toxic than sprays of the same material. Pesticides applied as wettable powder sprays tend to have longer residual effects (and are more toxic) than the emulsifiable concentrate sprays. Granular applications of pesticides are typically the safest method of treatment in areas with honey bee hives.
5. Avoid drift of toxic pesticide sprays onto ground-cover plants, weeds, and crops in nearby fields.
6. Control weeds in fields and avoid direct pesticide applications to flowering weeds when possible. Mow before pesticide application, if orchards have ground-cover plants in bloom.
7. Apply pesticides in the late evening or early morning when honey bees are not actively foraging. This is important with crops such as corn, since pollen is released in the morning. The evening application of pesticides to such crops are less hazardous and will reduce unintentional honey bee poisonings.
8. Do not apply pesticides if temperatures are expected to be unusually low following pesticide treatment. Pesticide residues can remain toxic to honey bees for longer periods of time under low temperature conditions.
9. Avoid the direct application of pesticides over honey bee hives.
10. Allow beekeepers with honey bee hives near areas to be treated with pesticides an option to move the hives or confine the honey bees, if there is a potential for honey bee loss.

NAPPC

PROTECT POLLINATORS
READ PESTICIDE LABELS

Four steps to reading a pesticide label to reduce risk to pollinating insects



www.pollinator.org/pesticide-education

Graphic by Iris Kormann and Andony Melathopoulos - Oregon State University; Rose Kachadoorian and Gilbert Uribe - Oregon Department of Agriculture
Text on reverse of card by the NAPPC Pollinator Health Task Force

MINIMIZING PESTICIDE EXPOSURE TO BEES

Understanding pesticide label information on the hazard and risks of bees is an important first step to protecting bees. Insecticides and some fungicides are of concern for bees. Here are a few actions to help minimize pesticide exposure to bees while managing pests and diseases.

1. Avoid sprays during bloom when possible. Bees face the highest exposure when pesticides are applied to the bloom of bee-attractive crops and weeds. When possible, use sprays before bloom to control pests and diseases to reduce the need for treatments at bloom.

2. If you must treat during bloom, choose products carefully and apply in the evening. Choose insecticides that are not labeled as 'Toxic' or 'Highly Toxic' to bees (front of card, Point 2). Avoid insecticides where residues remain toxic to bees for longer than 8 hours (Point 3). Always look to the Directions for Use for more specific information on when a product can be applied at reduced risk to bees (Point 4)

3. Cooperate and communicate with beekeepers in a timely manner. Contact beekeepers at least 48 hours prior to applying insecticides or fungicides to blooming bee-attractive crops. The beekeeper may choose to cover or move colonies, or may leave colonies in place depending on the toxicity of the product being sprayed.

4. Avoid spraying bee colonies and bee habitat. Avoid placing bees directly in the crop. In cases where colonies can only be set in the crop, turn sprayers off as you pass over the colonies. Reduce drift onto adjacent flowering habitat by using coarser droplet sizes, drift reducing agent, or intelligent sprayer technology.

5. Mow blooming weeds. If there are bee-attractive blooming weeds (e.g., mustard, clover or dandelion), mow them before spraying.

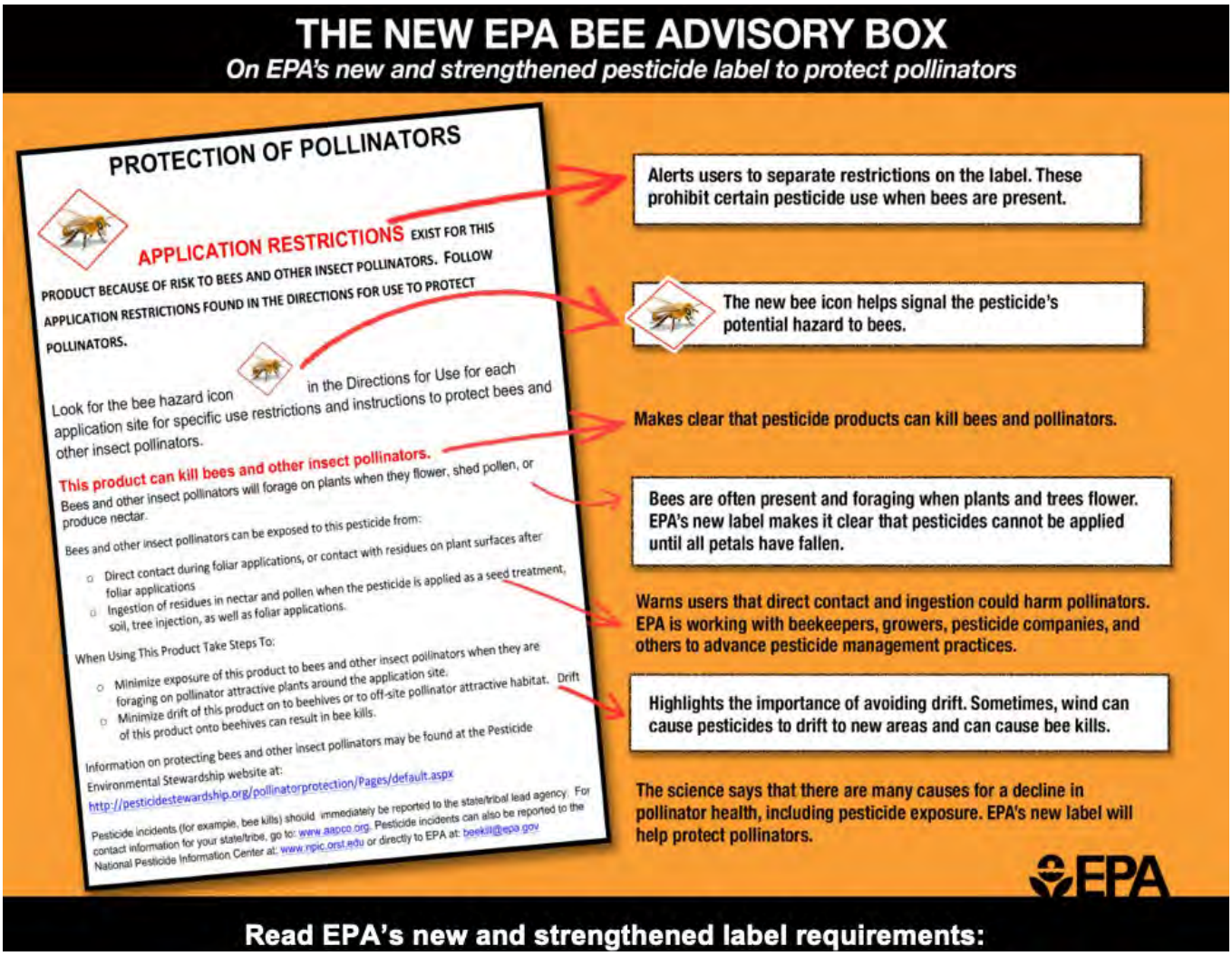
6. Review Pollinator Protection Plans and use IPM. Many states and industries provide information on how to protect bees and other pollinators. Contact your Department of Agriculture to obtain these plans. Integrated Pest Management (IPM) can also reduce bee pesticide exposure. Contact your regional IPM Center for details.

7. Report pesticide incidents with bees. Let EPA know as soon as you think bees have been killed by a pesticide (beekill@epa.gov). Also reach out to your state or tribal pesticide regulatory agency - contact information can be found at: http://npic.orst.edu/incidents.

HELPFUL LINKS

The **North American Pollinator Protection Campaign (NAPPC)** is a growing collaborative body of more than 170 diverse partners, including respected scientists, researchers, conservationists, government officials and dedicated volunteers. NAPPC's mission is to encourage the health of resident and migratory pollinating animals in North America.

The SARE FFAR USDA National Institute of Food and Agriculture U.S. DEPARTMENT OF AGRICULTURE North Central IPM Center


THE NEW EPA BEE ADVISORY BOX
On EPA's new and strengthened pesticide label to protect pollinators
PROTECTION OF POLLINATORS
APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.
Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.
This product can kill bees and other insect pollinators.
Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.
Bees and other insect pollinators can be exposed to this pesticide from:
Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.
When Using This Product Take Steps To:
Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives can result in bee kills.
Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at:
http://pesticidestewardship.org/pollinatorprotection/Pages/default.aspx
Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state/tribe, go to: www.aapco.org. Pesticide incidents can also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov
Alerts users to separate restrictions on the label. These prohibit certain pesticide use when bees are present.
The new bee icon helps signal the pesticide's potential hazard to bees.
Makes clear that pesticide products can kill bees and pollinators.
Bees are often present and foraging when plants and trees flower. EPA's new label makes it clear that pesticides cannot be applied until all petals have fallen.
Warns users that direct contact and ingestion could harm pollinators. EPA is working with beekeepers, growers, pesticide companies, and others to advance pesticide management practices.
Highlights the importance of avoiding drift. Sometimes, wind can cause pesticides to drift to new areas and can cause bee kills.
The science says that there are many causes for a decline in pollinator health, including pesticide exposure. EPA's new label will help protect pollinators.
EPA
Read EPA's new and strengthened label requirements:

Relative Toxicity of Pesticides to Honey Bees by Laboratory and Field Tests

See https://vtpp.ento.vt.edu/Public/pollinator-protection.html for greater detail on honey bee pesticide exposure.

Group I. Highly Toxic Compounds listed alphabetically by IRAC Classification

Severe losses may be expected if these pesticides are used when honey bees are present at treatment time or within a day thereafter.

See https://vtpp.ento.vt.edu/Public/pollinator-protection.html for greater detail on honey bee pesticide exposure.

IRAC Group	Active Ingredient
1A	carbaryl
1A	formetanate hydrochloride
1A	methomyl
1A	propoxur
1B	acephate
1B	chlorpyrifos
1B	diazinon
1B	dichlorvos
1B	dicrotophos
1B	dimethoate
1B	malathion
1B	naled
1B	phosmet
1B	pirimiphos-methyl

IRAC Group	Active Ingredient
2B	fipronil
3A	bifenthrin
3A	cyfluthrin
3A	cypermethrin
3A	cypermethrin
3A	deltamethrin
3A	esfenvalerate
3A	fenpropathrin
3A	gamma-cyhalothrin
3A	lambda-cyhalothrin
3A	permethrin
3A	prallethrin
3A	pyrethrins
3A	tefluthrin
3A	zeta-cypermethrin

IRAC Group	Active Ingredient
4A	clothianidin
4A	dinotefuran
4A	imidacloprid
4A	thiamethoxam
6	abamectin
6	avermectin
6	emamectin
6	emamectin benzoate
13	chlorfenapyr
21A	pyridaben
22A	indoxacarb
23	spirodiclofen
UN	bifenazate
UN	clofentezine

Group II. Moderately Toxic listed alphabetically by IRAC Classification

These can be used around honey bees if dosage, timing, and method of application are correct, but should not be applied directly on honey bees in the field or at the honey bee hive.

IRAC Group	Active Ingredient
1B	coumaphos
1B	ehtoprop
1B	phorate
1B	terbufos
3A	deltamethrin
5	spinosad

IRAC Group	Active Ingredient
7C	pyriproxyfen
15	novaluron
17	cyromazine
23	spirotetramet

Group III. Relatively Non-toxic listed alphabetically by IRAC Classification

These can be used around honey bees with a minimum of injury; safest if applied in the evening or early morning.

IRAC Group	Active Ingredient
1B	trichlorofon
3A	pyrethrum
3A	tau-fluvalinate
7A	methoprene
9	pymetrozine
10A	hexythiazox
10B	etoxazole
11	*Bacillus thuringiensis*
12B	fenbutatin oxide
12C	propargite

IRAC Group	Active Ingredient
15	diflubenzuron
16	buprofezin
18	tebufenozide
20B	acequinocyl
21A	fenpyroximate
23	spiromesifen
28	chlorantraniliprole
31	CM granulovirus
UN	azadirachtin

Fungicides

As a general rule, fungicides are safe to use around honey bees.

Afugan (pyrazophos)
Arasan (thiram)
Bayleton (triadimefon)
Benlate (benomyl)
bordeaux mixture
Boscalid (emerald, endura, pristine)
Bravo (chlorothalonil)
Captan
Carbendazim (Fungisol, Polyphase)
copper oxides
copper oxychloride sulfate
copper sulfate
cupric hydroxide (Kocide)
Cyprix (dodine)
Cyprodinil
Daconil (chlorothalonil)
Dessin (dinobuton)
Difenoconazole
Difolatan (captafol)
Dithane D-14 (nabam)
Dithane M (maneb, manzeb)
Dithane Z (zineb)
Du-Ter (fentin hydroxide)
Dyrene (anilazine)
ferbam
fluoxastrobin
Glyodin
Hinosan (edifenphos)
Indar (butrizol)
Iprodoine[2]
Karathane
Lesan (fenaminosulf)
Maneb
Mancozeb
Morestan (oxythioquinox)
Morocide (binapaeryl)
Myclobutanil
Mylone (dazomet)
Phygon (dichlone)
Plantvax (oxycarboxin)
Polyram (metriam)
Propiconazole[1] (Alamo, Banner)
Pyraclostrobin[2]
Pyrimethanil[1] (Philabuster, Penbotec)
Ridomil
Rovral (iprodione)[2]
sulfur
Syllit (dodine)
Terraguard[1], Procure (triflumizole)
Tetraconazole (Domark, Eminent)
Thiram
Thylate
Vinclozolin[2]
Vitavax (carboxin)
Zineb

[1] May increase the toxicity of neonicotinoid pesticides to honey bees if used together.
[2] May cause loss of honey bee larvae. Use with caution where honey bees are foraging.

Herbicides, Defoliants and Dessicants

2,4-D
2,4-DB
2,4-DP (dichlorprop)
Alachlor
Alanap (naptalam)
Alopex (clofop-isobutyl)
Amiben (chloramben)
Amitrol
Ammate
Atrex (atrazine)
Avenge (difenzoquat)
Balan (benefin)
Banvel (dicamba)
Basagran (bentazon)
Betanal AM (bentanex)
Bladex (cyanazine)
Blazer (acifluorfen)
cacodylic acid
Cambilene (2,3,6-TBA)
Caparol (prometryn)
Chloro-IPC (chlorpropham)
Cotoran (fluometuron)
Daconate (MSMA)
dalapon
diquat
DSMA
Dual (metolachlor)
Endothall (endothall)
Eptam
Evik (ametryn)
Evital (norflurazon)
Exhalt 800
Folex (desmedipham)
Garlon (triclopyr)
Glyphosate
Gramoxone (paraquat)
Herbisan (EXD)
Hoelon (diclofop-methyl)
Hyvar (bromacil)
IPC (propham)
Karmex (diuron)
Kerb (proamide)
Lasso (alachlor)
Lorox (linuron)
MCPA
Methar, DSMA
Milogard (propazine)
Modown (bitenox)
MSMA
Mylone (dazomet)
Nortron (ethofumesate)
Oxyfluorfen[1]
Paarlan (isopropalin)
paraquat
Pendimethalin[1] (Prowl)
Phenmedipham (Betanal)
Pramitol (prometone)
Princep (simazine)
Probe (methazole)
Propanil[1]
Prowl (pendimethalin)
Pyramin (chloridazon)
Ramrod (propachlor)
Randox
Ronstar (oxadiazon)
Sancap (dipropetryn)
Sencor (metribuzin)
Sinbar (terbacil)
Surflan (oryzalin)
Sutan (butylate)
Telvar (monuran)
Tolban (profluralin)
Tordon (picloram)
Treflan (trifluralin)[1]
Vegadex
Zorial (norflurazon)

[1] Slightly toxic to honey bees

Index

A

Acephate 1-25
Active ingredient 1-8, 1-13
Anilazine 1-36

B

Bacillus thuringiensis 1-25
Bagworm 1-9
Bee 1-25
Bee Poisoning 1-30
Benomyl 1-36
Binapaeryl 1-36
Butrizol 1-36

C

Captafol 1-36
Captan 1-36
Carbaryl 1-25
Caterpillars 1-9
Chemical control 1-6
Chemical emergencies 1-16
Chemical-resistant gloves 1-9, 1-15
Chemical spill kit 1-17
Chemical splash-proof goggles 1-14
Chlorothalonil 1-25, 1-36
Copper
  Copper oxides 1-36
  Copper oxychloride sulfate 1-36
  Copper sulfate 1-25, 1-36
Cupric hydroxide 1-36

D

Dandelion 1-1
Dazomet 1-36
Decontaminating sprayers 1-23
Dichlone 1-36
Dodine 1-36

E

Earthworms 1-12
Edifenphos 1-36
Environmental considerations 1-11

F

Fenaminosulf 1-36
Fentin hydroxide 1-36
Ferbam 1-36
Fish 1-1, 1-5, 1-9, 1-12
Flea 1-2
Fungicides 1-25

G

Glyodin 1-36
Glyphosate 1-25
Ground water 1-11

H

Herbicide 1-11, 1-12, 1-19, 1-23, 1-25
Honeybees
  Bee Poisoning 1-30
  Pesticides
    Toxicity 1-4, 1-7, 1-13, 1-34
  Poisoning 1-30

I

Insecticide 1-11, 1-12, 1-23, 1-25
Insects 1-1, 1-5, 1-6, 1-9, 1-12
Integrated pest management (IPM) 1-1, 1-5
Iprodione 1-36

M

Malathion 1-25
Mammals 1-25
Mancozeb 1-25, 1-36
Maneb 1-36
Manzeb 1-36

MCPA 1-25
MCPP 1-25
Mealybugs 1-9
Mechanical control 1-6
Metaldehyde 1-25
Metriam 1-36
Mites 1-9

N

Nabam 1-36

O

Oxycarboxin 1-36
Oxythioquinox 1-36

P

Parathion 1-13
Pathogens 1-5, 1-6
Pendimethalin 1-25
Pesticide ... 1-3, 1-4, 1-11, 1-14, 1-15, 1-16, 1-18, 1-20, 1-22, 1-23, 1-25, 1-26, 1-27
Pesticide label 1-1, 1-7, 1-8, 1-11, 1-14, 1-15, 1-23
Phenoxy herbicides 1-11, 1-23
Predatory 1-5
Prevention 1-1
Pyrazophos 1-36
Pyrethrum 1-25

S

Sanitation 1-6
Scales 1-9
Sulfur 1-25, 1-36

T

Thiram 1-36
Thrips 1-9
Thylate 1-36
Toxic 1-7, 1-11, 1-12, 1-13, 1-25, 1-27
Toxicity 1-7, 1-13, 1-25
Triadimefon 1-36
Triclopyr 1-25
Triflumizole 1-36

V

Vegetables 1-11, 1-23

W

Wettable powder 1-21, 1-22
Whiteflies 1-9

Z

Zineb 1-36